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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 4, NUMBER 14
JULY 15, 1971

W71-07059 -- W71-07701

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus** (November 1966 edition). Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency, Water Quality Office. A directory of the Centers appears on inside back cover.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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02 WATER CYCLE
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

ANOMALOUS WATER, POROUS GLASS AND SILICIC ACID,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
W. A. Adams, M. K. Gabe, P. G. Manning, S. H. Whitlow, and J. D. Kingham.
Nature Physical Science, Vol 230, No 2, p 39-40, Mar 8, 1971. 2 p, 1 fig, 1 tab, 12 ref.

Descriptors: *Water chemistry, *Water properties, *Gels, *Water structures, *Silica, Laboratory tests, Test procedures, Investigations, Pollutants.
Identifiers: *Anomalous water, *Polywater, Porous glass, Silicic acid.

Anomalous water formation in capillaries of 100 microns suggests that a high surface to volume ratio is necessary. The apparatus used incorporated porous Vycor glass and produced water with solid bodies when the water was concentrated. The Vycor is primarily composed of silica (96%). Organic impurities in the Vycor were burned off by heating at 550 deg C in oxygen, and the assembled apparatus was evacuated overnight. A 1,000 watt quartz iodide lamp was used to irradiate the cell because it was felt that strong irradiation would enhance surface reactions; the temperature of the Vycor glass was approximately 100 deg C during the experiments. Water diffusing through the Vycor glass leaches out cations from the glass at the very high pressures within the micropores. The volume of condensate decreased by two-thirds when desiccated for two days and the volume of the solid bodies which appeared was approximately 1% of the volume of liquid collected. X-ray diffraction photographs and the absence of extinction in polarized light suggested that the solids were amorphous. Observations suggest that anomalous water is probably a silicic acid solution. (Woodard-USGS)
W71-07263

1B. Aqueous Solutions and Suspensions

ION PAIRING IN 2:2 COMPLEX ION ELECTROLYTES: (Co (NH3)5NO2)SO4,
Connecticut Univ., Storrs. Dept. of Chemistry.
W. L. Masterton, and Thomas Bierly.
Journal of Physical Chemistry, Vol 74, No 1, p 139-143, Jan 8, 1970. 5 p, 2 tab, 18 ref. OWRR Project A-013-CONN (5).

Descriptors: *Ionization, *Electrolytes, *Conductivity, *Aqueous solutions, Mathematical studies, Equations, Cobalt, Sulfates, Ions, Evaluation.
Identifiers: *Fuoss theory, *Ion pairing.

Conductivity data are reported for aqueous solutions of (Co (NH3)5NO2)SO4 in the concentration range 0.0004 to 0.001. The Shedlovsky method was used to calculate an ion pair dissociation constant of 0.0025. The pK value (2.60) is significantly larger than those of simple 2:2 sulfates, corresponding to greater association. This effect has been noted previously with salts of lower charge types. A comparison of observed pK values with those calculated using the Fuoss theory of ion-pair formation suggests that nonelectrostatic forces are of major importance in 2:1 and, particularly, in 1:1 coordination compounds. (Woodard-USGS)
W71-07248

PHYSICO-CHEMICAL PROPERTIES OF SOLS AND GELS OF Na-MONTMORILLONITE WITH AND WITHOUT ADSORBED HYDROUS ALUMINUM OXIDE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-07275

POLYWATER ON SILICA-FREE SUBSTRATES,
Commonwealth Scientific and Industrial Research Organization, Ryde (Australia). Div. of Food Preservation.
J. Middlehurst, and L. R. Fisher.
Nature, Vol 230, No 5296, p 575, Apr 30, 1971. 1 p, 1 fig, 14 ref.

Descriptors: *Water chemistry, *Chemical properties, *Water types, *Water properties, *Silica, Analytical techniques, Water structure, X-ray diffraction, Gels.
Identifiers: *Polywater, *Anomalous water.

Experiments using semiconductor grade, single crystal silicon, 'Irtran-2' (sintered polycrystalline zinc sulphide), silver chloride, and fused silica ('Infrasil') gave no detectable product. But after 3 days at 97% relative humidity, magnesium oxide single crystals (99.95% pure, artificially grown periclase (Spicer)) became covered with a surface layer of a translucent substance approximately 2 micrometers thick. The infrared spectrum of this material, both on the periclase surface and on a calcium fluoride surface, after transfer by scraping with a barium fluoride crystal, was similar to that of the polywater prepared by Lippincott, et al., together with a small proportion of normal water. (Woodard-USGS)
W71-07603

02. WATER CYCLE

2A. General

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
Earnest Y. Liou.
Available from the National Technical Information Service as PB-198 442, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 34, 1970. 299 p, 10 fig, 26 tab, 26 ref, 3 append. OWRR Project C-1282 (No 1964) (3).

Descriptors: *Computer models, *Hydrologic budget, *Streamflow, Flood control, Hydrographs, Infiltration, Parametric hydrology, Runoff, Surface runoff, Watersheds (Basins).
Identifiers: *Stanford Watershed Model.

The Stanford Watershed Model uses a hydrologic budget to model the land phase of the hydrologic cycle and thereby simulate streamflow on a continuous basis from climatological data and watershed parameters. Values for key parameters are estimated by trial-and-error. Subjective estimating differences have made it difficult to correlate parameter values with known physical characteristics of the watershed. This study sought to computerize a parameter optimization procedure based on the FORTRAN version of the Stanford Watershed Model known as the Kentucky Watershed Model. The resultant self-calibrating watershed model is named OPSET because it determines an optimum set of parameter values by matching synthesized flows with recorded flows. The first step in program development used sensitivity studies to determine which watershed parameter values are critical in simulating flow and are difficult to measure directly. The second step was to adjust estimates of the selected parameters in a way systematically improving flow simulation until the best possible matching is achieved. Independent adjustment schemes were used for parameters associated with runoff volumes, recession flows, and flood hydrographs. The third step was to empirically improve the model by applying it to a number of watersheds in Kentucky. OPSET estimates watershed parameters on a one water year basis, and values best describing watershed characteristics should be averaged from several OPSET-selected one-year-based values. See also W71-07062 andW71-07063) (James-Georgia Tech)
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
Glendon A. Ross.
Available from the National Technical Information Service as PB-198 443, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 35, 1970. 178 p, 22 fig, 28 tab, 67 ref, 2 append. OWRR Project C-1282 (No 1964) (4).

Descriptors: *Streamflow, *Urbanization, *Watersheds (Basins), Computer models, Infiltration, Surface runoff, Watershed management.
Identifiers: *Stanford Watershed Model.

Streamflow simulation provides a powerful tool for developing better information on flow magnitudes and time patterns for the design of water resources projects. A self-calibrating simulation model was applied to about 20 Kentucky watersheds and successfully used to estimate appropriate values for model parameters. The procedure required to develop the necessary input data is explained in sufficient detail to essentially by a users' manual for the program. Physical descriptions of the watersheds are presented, and a number of key watershed characteristics (soil depth, permeability, cover, etc.) were measured. Relationships between model parameters (based on the Stanford Watershed Model) and watershed characteristics were explored. Those which are most promising in estimating parameter values for use in modeling streamflow from ungaged watersheds are presented. Parameter values were also estimated for a series of years spanning a period of intensive urbanization, and statistically significant trends were noted. The results provide framework for modeling changes in streamflow magnitudes and time patterns associated with urban development. (See also W71-07061 and W71-07063) (James-Georgia Tech)
W71-07062

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
L. Douglas James.
Available from the National Technical Information Service as PB-198 444, $3.00 in paper copy, $0.95 in microfiche. Water Resources Institute Research Report No 36, 1970. 117 p, 2 fig, 21 tab, 48 ref. OWRR Project C-1282 (No 1964) (5).

Descriptors: *Flood control, *Flood damage, *Streamflow, *Watersheds (Basins), Computer models, Land use, Non-structural alternatives, Runoff, Surface runoff, Urbanization, Watersheds (Basins).
Identifiers: *Stanford Watershed Model.

More informed selection among alternative flood control measures requires better information on marginal differences in flood hazard associated with marginal differences in tributary watershed characteristics. Hydrologic modeling is the most promising approach to answering this question; however, the use of existing models is hampered by the absence of information correlating model parameters with physical characteristics of the watershed. To deal with this situation, a method was developed for estimating the parameter values for the Stanford Watershed Model which best match recorded with simulated streamflows. Physical characteristics were measured for 17 rural watersheds. Correlations between the characteristics and the parameters were examined. Changes in parameter values with urbanization were also examined. The results were used to study variations in downstream flood peaks and in average annual flood damages associated with various tributary watershed characteristics. The end product is designed to help guide urban develop-

ment to minimize flood damage and storm drainage cost. (See also W71-07061 andW71-07062) (James-Georgia Tech)
W71-07063

AN APPROACH TO RESERVOIR TEMPERATURE ANALYSIS,
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 06A.
W71-07072

SUMMARY AND EVALUATION OF METHODS FOR DETECTING HYDROLOGIC CHANGES,
Agricultural Research Service, Athens, Ga. Southwest Watershed Research Center.
Willard M. Snyder.
Journal of Hydrology, Vol 12, No 4, p 311-338, Mar 1971. 28 p, 4 fig, 6 tab, 31 ref.

Descriptors: *Model studies, *Mathematical models, *Rainfall-runoff relationships, *Reviews, *Hydrologic equation, Systems analysis, Streamflow forecasting, Statistical methods, Linear programming, Regression analysis, Data processing, Runoff.
Identifiers: *Hydrologic change.

Methods for detection of hydrologic change were summarized on broad lines by classifying hydrologic data as statistical variates with definite statistical properties. The number of variates is controlled by available data, by the experimental design, and by the nature of the statistical test to be performed. The hydrologic variates may or may not be independent of each other, and they may or may not be serially independent in time. The number of variables in the test and their properties of independence control the analytical model used for testing a null hypothesis of change. The models treated in this paper are regression-discriminant models using time as a parametric expression of change. Of the models presented in this paper, only those intended for linear relationships of independent variates are considered well founded in both theory and practice. Many of the models are intended only for statistical discrimination between sets of hydrologic data. Models designed for detection of hydrologic change are probably not good representations of watershed systems. (Knapp-USGS)
W71-07271

STOCHASTIC SIMULATION OF MONTHLY STREAMFLOW BY A MULTIPLE REGRESSION MODEL UTILIZING PRECIPITATION DATA,
Nevada Univ., Reno. Desert Research Inst.
Jochanan Bonne.
Journal of Hydrology, Vol 12, No 4, p 285-310, Mar 1971. 26 p, 11 fig, 4 tab, 13 ref. OWRR Project A-026-NEV (3).

Descriptors: *Simulation analysis, *Rainfall-runoff relationships, *Stochastic processes, *Regression analysis, Systems analysis, Data collections, Data processing, Parametric hydrology, Mathematical models, Rainfall disposition, Computer programs, Markov processes.
Identifiers: *Stochastic models, *Operational hydrology.

A model for simulation of monthly streamflow series was developed by a multiple regression approach, which includes both precipitation and flow. The variables in the regression function represent the previous month's precipitation, antecedent month's precipitation, and the accumulated precipitation as independent variables, while the dependent variable is the current streamflow. A procedure is given for generating precipitation data. The frequency distribution of the flow record in each month is determined by statistical analysis. These monthly distributions are later imposed on the model in order to reproduce data with the same statistical parameters and distributions. Variables for the regression model are selected according to least variance, largest coefficient of determination, and the results of significance tests. Streamflows were simulated for 3 basins and results were compared with the historic record in terms of statistical parameters and frequency distribution. Results in general show good agreement with the historical data, mainly in terms of mean, standard deviation, and frequency distribution. Poorer agreement was found in the case of the less reliable parameters like skew coefficient and serial correlation. (Knapp-USGS)
W71-07334

MEAN ANNUAL RAINFALL/RUN-OFF RELATIONSHIP,
L. H. Young.
J Ind Water Engrs, Vol 24, No 7, p 423-430, Oct 1970. 1 fig, 3 tab.

Descriptors: *Rainfall-runoff relationships, *Cities, Analysis, Water loss.
Identifiers: *Urban hydrology.

World wide data are analyzed to investigate the relationship between the mean annual runoff, rainfall, and temperature of cities. Other parameters considered are found to have little independent effect. For non-arid climates the relationship is a straight line for which the slope is unity for 50 degrees F, steeper for lower temperatures, and flatter for higher temperatures. Water loss is found to be independent of rainfall only in the region of 50 degree F. A general runoff formula is developed for the overseas data, and a separate formula for the British Isles.
W71-07512

A DETAILED ANALYSIS OF CLIMATOLOGICAL AND HYDROLOGICAL RECORDS OF SOUTH FLORIDA WITH REFERENCE TO MAN'S INFLUENCE UPON ECOSYSTEM EVOLUTION,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
Thomas M. Terence.
Technical Report, 70-2, Oct 1970. 111 p, 34 fig, 12 tab, 33 ref. US National Park Service Contract DI-NPS-14-10-1-160-18.

Descriptors: *Ecosystems, *Climatology, *Hydrology, *Rainfall, *Water levels, *Water table, *Sea level, *Salinity, Florida.

Man's colonization of Southern Florida over the last 100 years and his influence upon the natural ecological environment has been well documented. Changes in the level of the fresh water table due to this influence, the rise in sea level due to deglaciation, and the changes in estuarine and near shore salinities are considered. Through modifications of the major natural resource, water, the rate of ecological change is 100 times as fast as if it had evolved naturally and the result has been that of ecosystem destruction. This study is of the fundamental parameters upon which other more detailed studies for environmental planning might be based. (Ensign-PAI)
W71-07672

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W71-07689

2B. Precipitation

HURRICANE BEULAH. A REPORT IN RETROSPECT ON THE HURRICANE AND ITS EFFECT ON BIOLOGICAL PROCESSES IN THE RIO GRANDE VALLEY, TEXAS,
Department of Agriculture, Gainesville, Fla. Biology Research Lab.
N. E. Flitters.
International Journal of Biometeorology, Vol 14, No 3, p 219-226, 1970. 2 fig, 5 ref.

Descriptors: *Hurricanes, *Atmospheric pressure, *Rainfall, *Animal behavior, *Metabolism, Semiarid climates, Texas, Rio Grande, Environmental effects, Flood damage, Ecology, Climatic data, Citrus fruits, Plant growth, Winds, Animal populations, Insects.
Identifiers: *Rio Grande Valley.

On 20 September, 1967, Hurricane Beulah, with winds of 94.7-113 knots and a barometric pressure of 951.5 mb, struck Brownsville, Texas, moving northwestward over southern Texas. In the following 4 days, torrential rains fell, totalling almost 76 cm in some areas. Over 8000 people were injured and more than 2 billion dollars worth of property was destroyed. The author was at the Entomology Research Center in Brownsville during the hurricane and was able to observe the caged insects at the center before and during the hurricane, and wild populations of animals and plants after the worst of the hurricane. The Laboratory insects were hyperactive during the hurricane and it is suggested that this phenomenon results solely from metabolic changes induced by changes in atmospheric pressure. Insect populations normally increase greatly after such torrential rains and this was confirmed by such increases about 3 weeks after Beulah. Probably the climatic changes resulting from the storm were sufficient to trigger presumably arrested advanced development. Among birds, robins, jackdaws, sparrows and doves suffered the greatest mortality. When the sun reappeared, many passing and rarely-seen species were observed in food searching activity. Many plants were shorn of their folliage, but in the warm sunny period following the hurricane they began new growth, which conceivably resulted from the breaking of dormancy by the climatic changes. Citrus fruits were especially hard hit in the Rio Grande Valley, with trees destroyed and skin fruits ruptured. (Casey-Arizona)
W71-07159

THE STRUCTURE OF THUNDERSTORM RAINFALL,
Illinois State Water Survey, Urbana.
John B. Stall, and Floyd A. Huff.
ASCE National Water Resources Meeting, Phoenix, Arizona, Jan 11-15, 1971. Meeting Preprint 1330. American Society of Civil Engineers, Jan 1971. 30 p, 12 fig, 7 tab, 11 ref. Price $0.50.

Descriptors: *Thunderstorms, *Storm structure, *Rainfall disposition, *Cloudbursts, *Drainage engineering, *Design storm, Storm runoff, Design data, Design criteria, Weather patterns, Precipitation, Central US, Illinois, Urbanization, Rain, Hydrographs, Surface runoff, Storms, Rainfall-runoff relationships.
Identifiers: *Thunderstorm rainfall.

Procedures were developed that can be used to better specify storm rainfall as an aid in producing better designs of urban storm drainage systems. Heavy storm rainfall in the Midwest occurs most frequently from thunderstorm cells. The rain cell reaching the ground has a diameter of 3 to 6 miles, an area of 15 to 30 square miles, moves at a velocity of 20 to 30 miles per hour, and has a duration of 30 to 60 minutes. Most of the rainfall occurs during the first 10 minutes; it occurs in 2 to 4 bursts, and 2 or 3 cells usually occur together. The resulting dynamic rainfall input onto an urban basin is a matrix in six dimensions of: depth, area, duration, frequency, sequence, and place. In consideration of the possible mean, inherent variability, and skew of each of these six parameters the resulting matrix is almost impossible to evaluate. Illustrations are given of five traditional, two-dimensional plots dealing with various pairs of these six parameters or dimensions. Using point rainfall data for north-central Illinois, the Road Research Hydrograph Method is used for an urban basin in Chicago to show the effect of rainfall variability on the resulting flood runoff hydrograph. For various recurrence interval events, deviations from the mean rainfall depth of 6 to 15 percent are reflected directly in the resulting flood peaks. This exempli-

fies an inherent variability which must be accommodated in all storm drainage design. (Poertner)
W71-07196

ATLANTIC HURRICANE SEASON OF 1970,
National Oceanic and Atmospheric Administration, Miami, Fla. National Hurricane Center.
R. H. Simpson, and Joseph M. Pelissier.
Monthly Weather Review, Vol 99, No 4, p 269-277, Apr 1971. 9 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Hurricanes, *Atlantic Ocean, *United States, *Storms, Reviews, Gulf of Mexico, Winds, Wind velocity, Precipitation (Atmospheric), Hydrologic data, Meteorological data, Tropical regions.
Identifiers: *Hurricanes (1970), *Tropical storms, Storm damage.

A general overview of the 1970 hurricane season in the North Atlantic is presented together with detailed accounts of all named tropical cyclones and certain subtropical or hybrid storms. Of the seven named Atlantic storms of 1970, only three reached hurricane intensity; and only Celia brought hurricane-force winds to the United States. These figures compare with a total of 180 tropical storms and hurricanes over the past two decades for a yearly average of nine. Of these, an average of three per year crossed the U.S. coastline, and three every 2 years brought hurricane winds to the mainland. Nevertheless, 1970 will be remembered as the year of Celia, the most destructive storm ever to reach the Texas coast. (Woodard-USGS)
W71-07265

AN APPARENT RELATIONSHIP BETWEEN THE SEA-SURFACE TEMPERATURE OF THE TROPICAL ATLANTIC AND THE DEVELOPMENT OF AFRICAN DISTURBANCES INTO TROPICAL STORMS,
National Oceanic and Atmospheric Administration, Miami, Fla. National Hurricane Center.
Toby N. Carlson.
Monthly Weather Review, Vol 99, No 4, p 309-310, Apr 1971. 2 p, 1 fig, 1 tab, 4 ref.

Descriptors: *Storm structure, *Water temperature, *Atlantic Ocean, *Tropical regions, *Weather forecasting, Storms, Regression analysis, Hydrologic data, Meteorological data, Isotherms, Hurricanes, Surface waters.
Identifiers: *African coast.

An analysis of sea-surface temperatures over the tropical Atlantic for the past 5 yr shows a correlation between the number of tropical storms formed between July 10 and September 20 and the ocean temperatures over a wide area centered near 10 deg N and 35 deg W. If the sea-temperature anomaly in the tropical Atlantic proves to be persistent for periods of several months, it may become useful as a predictor of hurricane activity for that season. (Woodard-USGS)
W71-07266

A SNOWFALL PREDICTION METHOD FOR THE ATLANTIC SEABOARD,
Allied Research Associates, Inc., Concord, Mass.; and Center for the Environment and Man, Inc., Hartford, Conn.
David B. Spiegler, and George E. Fisher.
Monthly Weather Review, Vol 99, No 4, p 311-325, Apr 1971. 15 p, 28 fig, 2 tab, 15 ref.

Descriptors: *Snowfall, *Melt water, *Weather forecasting, *Atlantic coastal plain, Model studies, Reviews, Hydrologic data, Meteorological data, Climatic data, Methodology.
Identifiers: *Atlantic seaboard, *Snowfall prediction.

Melted precipitation and snowfall data from eight winters were used to develop a snow and melted precipitation prediction model associated with 850-mb cyclones along the Atlantic Seaboard. The major potential for heavy snow exists in a band extending from 75 to 225 miles to the left and from 250 to about 1,000 miles ahead of the 850-mb cyclone in the 12-hr period beginning 6 hr after routine upper air observation time. Application of the prediction model of snow amounts to some storms from the 1968-1969 winter season indicate they provide valuable guidance to the forecaster during periods of East Coast storms. (Woodard-USGS)
W71-07267

ATLANTIC TROPICAL SYSTEMS OF 1970,
National Oceanic and Atmospheric Administration, Miami, Fla. National Hurricane Center.
Neil L. Frank.
Monthly Weather Review, Vol 99, No 4, p 281-285, Apr 1971. 5 p, 3 fig, 4 tab, 6 ref.

Descriptors: *Storms, *Hurricanes, *Tropical regions, *Storm structure, Reviews, Atlantic Ocean, Gulf of Mexico, United States, Meteorological data, Data collections.
Identifiers: *Tropical storms, *Storm origins, *Storms (1970).

The history of all tropical systems that formed over the Atlantic, Caribbean, and Gulf of Mexico during the 1970 hurricane season is documented. There were a total of 87 systems from which 26 depressions and seven named storms evolved. Systems that originated on the Atlantic side of Central America played a very prominent part in producing a bumper crop of east Pacific storms and hurricanes where 18 storms formed. Eleven of these were initiated by systems of African origin. Two were spawned by waves that formed over the Caribbean, and five storms emerged from the ITCZ in the Pacific. (Woodard-USGS)
W71-07268

CALCULATION OF MEAN AREAL DEPTH OF PRECIPITATION,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
J. E. Akin.
Journal of Hydrology, Vol 12, No 4, p 363-376, Mar 1971. 14 p, 9 fig, 2 tab, 3 ref, 2 append.

Descriptors: *Depth-area-duration analysis, *Computer programs, Runoff forecasting, Rainfall-runoff relationships, Networks, Rain gages, Precipitation (Atmospheric), Data processing.
Identifiers: *Precipitation data analysis.

A new procedure for the calculation of the mean areal depth of precipitation is presented and compared with the commonly used methods. The procedure is conceptually simple and easily programmed for computer application. This procedure assumes a linear distribution of precipitation between stations. Thus its accuracy is directly dependent on the accuracy of this assumption. There are many cases where the true distribution of precipitation is not linear. A coarse linear distribution probably would not adequately model the true distribution. In such cases, one should obtain better accuracy by using the nonlinear distribution model also presented. (Knapp-USGS)
W71-07270

STORM INTENSITIES VERSUS SEASONAL RAINFALLS,
Melbourne Univ. (Australia). Dept. of Agricultural Engineering.
A. K. Turner.
Journal of Hydrology, Vol 12, No 4, p 377-386, Mar 1971. 10 p, 3 fig, 6 tab, 11 ref.

Descriptors: *Rainfall intensity, *Rainfall disposition, *Distribution patterns, Rain gages, Networks, Meteorology, Frequency analysis, Duration curves, Probability, Storm runoff, Statistical methods.
Identifiers: *Storm intensity.

To test the hypothesis 'if the seasonal distribution of rainfall is similar at two stations, there is probably a consistent relationship between intensity and duration of rainfalls for a given average frequency', data from three separated localities were examined. The results indicate close relationships between yearly, seasonal, monthly and the longer storm events, but discrepancies occur for the shorter time intervals. It is suggested that these discrepancies are due to thunderstorms and should be considered separately from the rest of the data. (Knapp-USGS)
W71-07272

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-07306

2C. Snow, Ice, and Frost

FINAL REPORT ON RESEARCH AND ENGINEERING DEVELOPMENT AND EVALUATION OF ICE NUCLEI DISPERSION SYSTEMS, MAY 1, 1967 TO MAY 1, 1970.
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 03B.
W71-07243

A SNOWFALL PREDICTION METHOD FOR THE ATLANTIC SEABOARD,
Allied Research Associates, Inc., Concord, Mass.; and Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 02B.
W71-07267

A BIBLIOGRAPHY OF ARCTIC WATER RESOURCES,
Alaska Univ., College. Inst. of Water Resources.
Charles W. Hartman, and Robert F. Carlson.
Available from the National Technical Information Service as PB-198 668, $3.00 in paper copy, $0.95 in microfiche. Alaska Institute of Water Resources, Report No IWR-11, Nov 1970. 552 p. OWRR Project A-031-ALAS (1).

Descriptors: *Alaska, *Arctic, *Cold regions, *Bibliographies, Polar regions, Subarctic, Permafrost, Glaciology, Snow.

This bibliography of 2978 references consists of two parts - a keywords listing and citation section. The entries were selected for inclusion on the basis of their relevance to the understanding the nature of the land-based water cycle in Alaska's Arctic and Sub-Arctic regions. All available references to Alaskan areas with the exception of the southeast region were included. With few exceptions material has been excluded which was primarily concerned with the mechanical aspects of permafrost and oceanographic data. References concerning glaciology, water supply, and waste disposal were not specifically searched, but were included when available.
W71-07333

MEASUREMENT OF DISCHARGE UNDER ICE COVER,
Department of Energy, Mines and Resources, Ottowa (Ontario). Inland Waters Branch.
P. W. Strilaeff, and J. H. Wedel.
Canada Dept. of Energy, Mines, and Resources, Inland Waters Branch Technical Bulletin No 29, 1970. 14 p, 13 fig, 1 tab.

Descriptors: *Discharge measurement, *Streamflow, *Ice, *Ice-water interfaces, Methodology, Stream gages, Instrumentation, Current meters, Water levels, Surface waters, Hydrologic data, Evaluation.

Identifiers: *Ice covered streams, *Northern Canada.

Many difficulties are encountered in the measurement of discharge under ice cover, particularly in the operation of hydrologic data-gathering networks located in Arctic and Sub-Arctic regions. Difficulties result from extreme ice thicknesses, double thicknesses of ice, large depths of slush ice, coincidence of spring flows with ice breakup, freeze-up of gaging equipment in sub-zero temperatures, etc. Some of these difficulties are discussed, and procedures used in the operation of networks in northern areas of Canada are outlined. A possible technique for the estimation of river discharge using a single velocity in a cross-section is briefly described, and a comparison of accuracy between discharges derived using this technique and measured discharges using standard methods is demonstrated. (Woodard-USGS)
W71-07609

PREDICTING THE DATE OF LAKE ICE BREAKUP,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
G. P. Williams.
Water Resources Research, Vol 7, No 2, p 323-333, Apr 1971. 11 p, 5 fig, 6 tab, 13 ref.

Descriptors: *Ice breakup, *Iced lakes, Melting, Lakes, Lake ice, Forecasting, Heat budget, Energy budget, Statistical methods, Wisconsin, Data collections.
Identifiers: *Canada, *Lake ice breakup.

Standard deviations for lake breakup dates were calculated for all lakes in Canada with reasonably long breakup records and for five lakes in Wisconsin with long-term records. Standard deviations were about 13 days for coastal lakes and 7-11 days for continental lakes. The accuracy of the melting degree day method of predicting breakup dates were investigated for 12 of these lakes; standard deviations ranged from 3.3-8.0 days. Regression equations for predicting breakup dates were developed from past breakup and air temperature records for the 12 lakes; standard errors ranged from 1.6-4.3 days. General forecast guidelines were developed for application to lakes with limited breakup records. The equations and forecast guidelines are suitable only for continental lakes where wind and river inflow effects are not dominant. (Knapp-USGS)
W71-07625

ESTIMATING THE EXTENT OF RIVER SLUSH ICE (K VOPROSU OB OTSENKE STEPENI SHUGONOSNOSTI REK),
For primary bibliographic entry see Field 02E.
W71-07656

2D. Evaporation and Transpiration

THE PRODUCTIVITY OF ZONAL TERRESTRIAL PLANT COMMUNITIES AND THE MOISTURE AND HEAT PARAMETERS OF AN AREA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. V. Drozdov.
Soviet Geography: Review and Translation, Vol 12, No 1, p 54-60, Jan 1971. 3 fig, 1 tab, 13 ref.

Descriptors: *Solar radiation, *Productivity, *Climatic zones, *Heat, *Evapotranspiration, Environmental effects, Plant growth, Moisture availability, Seasonal, Latitudinal studies, Biological communities.
Identifiers: *Dryness index.

Previous studies by Budyko and Grigor'yev indicate that the zonal distribution of plant production is related to the radiation index of dryness, radiation (R)/the amount of heat needed to evaporate the annual precipitation (Lr). They then suggested that: (1) Plant community productivities are maximal when R/Lr is at some optimal valve close to 1.0, and fall off on both sides of the optimal valve at constant R (2) For an optimal R/Lr valve, productivities will increase with increases of absolute valve of the components of the ratio. Unfortunately, their phytomass data did not include below ground portions of the plants and their precipitation figures were low. Using corrected data for 27 communities or zonal landscapes, the author demonstrates relationships between total annual growth of zonal plant communities in various thermal belts and dryness indices, total annual growth at different dryness indices and R, and R vs. R/Lr at different annual growths. Annual growth decreased steadily with increasing R/Lr and increased steadily with R. Increases of growth with R/Lr down to 0.5 (when R is greater than 40 kcal./sq.cm./yr.) indicates that a dryness index close to unity need not necessarily be optimal in all thermal belts. (Casey-Arizona)
W71-07155

EFFECT OF ENVIRONMENTAL FACTORS ON CUTICULAR TRANSPIRATION RESISTANCE,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agricultural Research.
S. Moreshet.
Supported in part by PL480 Grant A10-SWC-29 from the US Department of Agriculture. Plant Physiology, Vol 46, No 6, p 815-818, Dec 1970. 3 fig, 2 tab, 19 ref.

Descriptors: *Cuticle, *Transpiration, *Resistance, *Humidity, *Environmental effects, Mode of action, Laboratory tests, Stomata, Soil moisture, Theoretical analysis, Wettability, Drought resistance.
Identifiers: *Water potential, *Relative humidity.

Plant transpirational water flux takes place via stomatal apertures and through the cuticle. The influences of environmental conditions on cuticular transpiration are not well understood partly because cuticular resistance measurements have usually been made in the dark, assuming stomata were closed. Sunflower (Helianthus annus) plants, with all but the youngest leaf removed, were grown under 3 levels each of soil water potential, light intensity and relative humidity to which the leaves were exposed, allowing 27 different combinations, values of total leaf resistance (calculated from transpiration flux and water concentration gradient measurements) were measured, as well as values of upper and lower transpiration resistance and the sum of stomatal resistances on both sides of the leaf. The only factor affecting citicular transpiration was relative humidity, which was inversely proportional to cuticular resistance to water loss. This response may be explained by drought-caused cuticular shrinkage, alterations in the air-water interface or changes in the wettability of the cuticle. This phenomenon would be a useful adaptation to arid conditions, reducing water loss during drought, but allowing direct absorption of atmospheric moisture or dew during moist periods. (Casey-Arizona)
W71-07156

WATER STRESS AND APICAL DOMINANCE IN PISUM SATIVUM,
Regina Research Station (Saskatchewan).
For primary bibliographic entry see Field 02I.
W71-07283

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 07C.
W71-07306

2E. Streamflow and Runoff

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W71-07135

SERIAL CORRELATION IN ANNUAL STREAM RUNOFF,
Washington State Univ., Pullman. Dept. of Civil Engineering.
Kenneth W. Martig, Jr., and Thomas H. Campbell.
University of Washington, Charles W. Harris Hydraulics Laboratory, Technical Report No 24, June 1968. 43 p, 12 fig, 15 ref, 3 append. OWRR Project A-020-WASH (1).

Descriptors: *Mathematical models, *Streamflow, *Correlation analysis, *Simulation analysis, Hydrology, Forecasting, Planning, Gaging stations, Computer models, Sampling, Data collections, Markov processes, Model studies, Hydrologic data, Runoff.
Identifiers: *Thomas-Fiering algorhythm, *Historic flow records, *Serial correlation.

Using 31 streams of long historic annual stream flow record, the Thomas-Fiering algorhythm was found to be the best mathematical representative of sequential values of annual streamflow. This linear simulation was more accurate than these non-linear methods tested: the Sinh function method, the Three-Degree Polynomial method, the Natural Log of Flow vs. Natural Log Function method, and the One-Degree Markov chain. However, on 25 streams, multiple Markov chains produced the greatest reduction of unexplained error. Markov chains of 6 degrees or multiples of 6 were the most successful. The length of historic streamflow data was found insufficient for residual-number skewness of Kurtosis trends to be treated as anything but random variables, though skewness might appear if longer historic records were available. (Yensen-Arizona)
W71-07151

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04C.
W71-07184

AN APPROACH TO THE SELECTION OF A STREAMFLOW BASE PERIOD,
Wyoming Univ., Laramie. Water Resources Research Inst.
William N. Embree.
Wyoming Water Planning Report No 6, Water Resources Series No 20, July 1970. 112 p, 13 tab, 26 fig, 24 ref. OWRR Project A-001-WYO (33).

Descriptors: *Streamflow, *Synthetic hydrology, *Correlation analysis, *Mass curves, *Statistical methods, Sampling, Wyoming, Gaging stations, Correlation analysis, Water Resources Research Act.
Identifiers: *Base period, Mean, Standard deviation, Variation coefficient.

The 20-year period from 1948 to 1968 provides sufficient information on base period for Wyoming streamflow for 23 representative gaging stations. A base period is defined as a shorter period of record which has the same statistical properties as the longer record, and can be used in simplifying the study of water resources. The mean, standard deviation, and variation coefficient of the base period and long-term record should be similar. There was a 10% or less difference for most streams between 1948 to 1968 and longer record. The 20-year mean is within 6% of the longer mean with 95% confidence, and within 2% of the longer mean with 50% confidence for the Madison River.

Related research, methods of analysis, and detailed results are discussed. There are 13 tables of sample size, errors and station descriptions, 26 figures, and 24 references. (Popkin-Arizona)
W71-07188

HYDROLOGIC RECONNAISSANCE OF THE SINK VALLEY AREA, TOOELE AND BOX ELDER COUNTIES UTAH,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 02F.
W71-07244

WATER RESOURCES OF THE BELMONT-MARTHAVILLE-ROBELINE AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
A. J. Calandro, W. L. Broussard, and R. L. Hosman.
Louisiana Geological Survey and Department of Public Works Water Resources Pamphlet No 25, Nov 1970. 21 p, 1 fig, 5 tab, 10 ref.

Descriptors: *Water resources development, *Surface waters, *Groundwater, *Louisiana, *Water supply, Aquifers, Water quality, Reservoirs, Water yield, Water storage, Hydrologic data, Water utilization, Hydrology.
Identifiers: Bayou Dupont (La).

The water-supply sources available for public supplies for Belmont, Marthaville and Robeline, in west-central Louisiana, are appraised. Bayou Dupont and its tributaries cannot provide a dependable water supply for the area without use of storage facilities. At Robeline the stream flows 0.1 cubic foot per second or more 80 percent of the time, and 1.5 cubic feet per second or more can be expected 50 percent of the time. A reservoir on Bayou Dupont at Robeline with 790 acre-feet of storage could sustain a draft rate of 1 million gallons per day. Sediment concentrations during storm periods range from 1,000 to 3,800 milligrams per liter. The average sediment concentrations during other periods are about 300 mg/liter. Fresh groundwater is available from sands of the Wilcox Group. The water is generally soft but locally may be highly colored. The iron content varies and can be high enough to require treatment for removal to be suitable for public supplies. (Woodard-USGS)
W71-07246

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 07C.
W71-07251

A PROPOSED STREAMFLOW DATA PROGRAM FOR ARKANSAS,
Geological Survey, Little Rock, Ark.
For primary bibliographic entry see Field 07A.
W71-07254

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1970,
Geological Survey, Albuquerque, N. Mex.
J. A. Basler.
Geological Survey Basic-Data Report (Open file), Mar 1971. 33 p, 8 fig, 4 tab.

Descriptors: *Water resources development, *Surface waters, *Hydrologic data, *Groundwater, *New Mexico, Water quality, Water wells, Pumping, Water yield, Water level fluctuations, Streamflow, Runoff, Flow measurement, Precipitation (Atmospheric), Chemical analysis, Data collections, Evaluation.
Identifiers: *White Sands Missile Range (N Mex).

Information on the water resources of the White Sands Missile Range in New Mexico that was collected during the period January 1970 to January 1971 by personnel of the U.S. Geological Survey, Water Resources Division is presented. Data on groundwater pumpage and resulting water-level fluctuation, chemical quality, precipitation, and surface-water runoff are summarized. Total groundwater pumpage at White Sands Missile Range in 1970 was 923,059,000 gallons. Declines of water level occurred in all wells located within a radius of about 1 mile of the middle of the Post Headquarters well field. The chemical quality of water samples collected during 1970 was similar to that of samples collected from the same sources during 1969. The specific conductance of samples collected in December 1969 and 1970 ranged from 242 to 2,580 micromhos in 1969 and from 262 to 2,780 in 1970. Surface-water runoff amounts of 14 acre-feet, and 61 acre-feet were recorded in 1970 at the gage 1 mile north of the Main Gate, and 1.5 miles south of the Main Gate, respectively. During 1969 the runoff at the north gage totalled 132 acre-feet; 96 acre-feet were recorded at the south gage. (Woodard-USGS)
W71-07284

A PROPOSED STREAMFLOW DATA PROGRAM FOR PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 07A.
W71-07299

A PROPOSED STREAMFLOW DATA PROGRAM FOR MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
For primary bibliographic entry see Field 07A.
W71-07300

A PROPOSED STREAMFLOW DATA PROGRAM FOR MINNESOTA,
Geological Survey, St. Paul, Minn.
For primary bibliographic entry see Field 07A.
W71-07301

A PROPOSED STREAMFLOW-DATA PROGRAM FOR MONTANA,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 07A.
W71-07302

PROBABILITIES FOR SIMULTANEOUS OCCURRENCE OF FLOODS IN THE DANUBE AND INN RIVERS BEFORE AND AFTER COMPLETION OF STRUCTURES IN THE DANUBE RIVER,
Gert A. Schultz.
Wasserwirtschaft, Vol 9, p 293-296, 1970. 9 fig, 1 tab, 6 ref.

Descriptors: *Floods, *Flooding forecasting, Synthetic hydrology, Hydraulic structures.
Identifiers: *Danube River, *Inn River.

The flood statistics for the city of Passau reveal that whenever one of these two rivers carried a flood wave the other produces a flood several days after. The Danube peak usually follows the Inn peak. Based on 67 independent flood events between 1926 and 1967, the probability for the 'critical case' (the simultaneous occurence of flood peaks of the Danube and Inn Rivers' confluence) has been investigated and reported herein. An attempt has been made to estimate the influence of hydraulic structures in the Danube river upstream of the confluence on the 'critical case' probability. If this influence can be determined then it is possible to investigate the future tendency of a synthetic flood frequency analysis for the Danube river downstream of the confluence.
W71-07513

EVALUATION OF THE QUANTITY AND QUALITY OF THE WATER RESOURCES OF VOLUSIA COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
Darwin D. Knochenmus, and Michael E. Beard.
Florida Bureau of Geology Report of Investigations No 57, 1971. 59 p, 22 fig, 8 tab, 15 ref, append.

Descriptors: *Water resources development, *Florida, *Aquifers, *Streamflow, Artesian wells, Recharge, Natural recharge, Water yield, Water quality, Water balance, Groundwater movement, Groundwater, Surface waters.
Identifiers: *Volusia County (Fla).

Velousia County includes about 1,200 square miles along the central east coast of Florida. Water use in 1967 averaged about 25.9 mgd, of which the major use (15.8 mgd) was for public supply. In the 20-year interval, 1950 to 1970, the amount of water used for public supply, all of which is groundwater, more than doubled. On the average, it is estimated that 300 mgd is available for man's use. Ninety-five percent of the water used in Volusia County comes from the Floridan aquifer. Recharge to the Floridan aquifer occurs throughout the county wherever the water table in the surface aquifer is higher than the piezometric surface in the Floridan aquifer. In the central part of the county the clastic aquifer is full and rejecting recharge through runoff and evapotranspiration. If the piezometric surface were lowered in this area by withdrawing water from the Floridan aquifer for use, this rejected recharge would be decreased by the capture of water. This would increase the amount of water available for use. The average streamflow is many times larger than the water use for the entire county supply. (Knapp-USGS)
W71-07599

EFFECTS OF MECHANICAL CLEANING OPERATIONS ON FLOW IN LARGE CONDUITS,
Metropolitan Water District of Southern California, Los Angeles. Hydraulic Design Section.
For primary bibliographic entry see Field 08B.
W71-07615

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
R. L. Pentland, and D. R. Cuthbert.
Water Resources Research, Vol 7, No 2, p 283-291, Apr 1971. 9 p, 4 fig, 3 tab, 6 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Streamflow forecasting, Stream gages, Data collections, Planning, Gaging stations, Rainfall-runoff relationships, Mathematical models.
Identifiers: *Canada, *New Brunswick (Canada).

The definition of areal runoff in geographic areas with basically similar hydrologic characteristics can be facilitated by the grid square technique. This technique entails dividing the study area into a uniform grid. Such a procedure provides a means of storing and retrieving information regarding the grid square areas. The grid square technique is used extensively in Canada for assessing water resource potential as well as for planning hydrometric networks. The method can conveniently be extended to generate synthetic streamflow traces on ungaged streams. The grid square technique and its extension to operational hydrology are discussed, along with an example from the New Brunswick region of Canada. (Knapp-USGS)
W71-07622

DERIVATION OF BASE FLOW RECESSION CURVES AND PARAMETERS,
Illinois State Water Survey, Urbana.
Krishan P. Singh, and John B. Stall.
Water Resources Research, Vol 7, No 2, p 292-303, Apr 1971. 12 p, 6 fig, 3 tab, 17 ref.

Descriptors: *Base flow, *Recession curves, *Surface-groundwater relationships, *Water storage, Hydrographs, Hydrograph analysis, Discharge (Water), Streamflow, Streamflow forecasting, Runoff forecasting, Storage coefficient.
Identifiers: *Boussinesq equation.

The Boussinesq equation is used to show that base flow recession is an exponential decay function. For a single peaked hydrograph, the storage delay factor Kb, which is the time for base flow to decrease by a factor of 10, is estimated. The parameter Kb is adjusted by trial so that surface flow, or the observed total flow minus base flow, is also an exponential decay function after the point of inflection on the hydrograph recession. The same parameter for surface flow, Ks, is so determined. For 22 basins in Illinois, the dormant season Kb ranges from 15-100 days and is associated with physiography. Ks varies from 1.8-6.0 days. (Knapp-USGS)
W71-07623

STREAM CHANNELS AND FLOW RELATIONS,
Minnesota Univ., Minneapolis. Dept. of Geography.
Dwight A. Brown.
Water Resources Research, Vol 7, No 2, p 304-310, Apr 1971. 7 p, 2 fig, 3 tab, 4 ref.

Descriptors: *Stage-discharge relations, *Streamflow forecasting, *Flood forecasting, *Channel morphology, Frequency analysis, Open channel flow, Rainfall-runoff relationships, Discharge coefficients, Water levels.
Identifiers: *Channel capacity.

Channel capacity is considered as a reconnaissance technique for estimating mean flow and the magnitude of floods at various expected frequencies. Low flows have diminishing relationships to channel capacity with increasing severity of low flow. Equations were derived to estimate flood magnitudes and provided good results when tested within the same environment. The coefficients of the derived equations lack transferability to different physical environments. (Knapp-USGS)
W71-07624

A STUDY OF THE BASE FLOW CHARACTERISTICS OF THE CHAO PHRAYA RIVER,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Vatana Meevasana.
M Sc Thesis, No 283, Asian Institute of Technology, Bangkok, 1969. 94 p, 19 fig, 19 tab, 28 ref, 3 append.

Descriptors: *Base flow, *Streamflow, *Rainfall-runoff relationships, *Surface-groundwater relationships, Statistical methods, Regression analysis, Mathematical studies, Flow characteristics, Data collections, Hydrologic data, Irrigation, Evaporation.
Identifiers: *Chao Phraya River (Thailand).

Variations of base flow in the Chao Phraya River at Nakhon Sawan, Thailand, are predicted. A statistical method is used to correlate the base flow characteristics with the change in hydrologic and physiographic factors over the drainage basin. Flood season runoff volume, flood peak discharge, and current year rainfall are the indicators of groundwater recharge, but they depend on each other. Since these variables are not independent of each other they are not selected at the same time in a multiple regression equation. Only the most suitable one is selected. Among the various measures describing the carry over storage, the dry season base flow volume of the preceding year gives the most significant correlation to the volume of current year base flow. The water used in irrigation is mainly diverted from the base flow since no large storage dams had been built prior to 1962. The dry season rainfall is less than the accumulated draft on soil moisture due to evapotranspiration. So it creates neither direct runoff nor groundwater recharge to affect the base flow. (Woodard-USGS)
W71-07631

FLOOD HYDROGRAPHS FROM SMALL WATERSHEDS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Engineering.
Chumporn Komsartra.
M Sc Thesis, No 278, Asian Institute of Technology, 1969. 73 p, 29 fig, 6 tab, 19 ref, 6 append.

Descriptors: *Rainfall-runoff relationships, *Small watersheds, *Hydrographs, *Model studies, *Streamflow, Flow characteristics, Peak discharge, Mathematical model, Equations, Regression analysis, Methodology, Design flood.

A method for the determination of the peak rate of runoff and the design hydrograph from small ungaged watersheds of drainage area up to 1000 square kilometers is presented. Flood hydrographs from 5 small watersheds were analyzed. The mathematical model, a two parameter gamma distribution, was fitted to the observed hydrograph. The average dimensionless unit hydrograph is recommended for determination of design hydrographs for a tropical regions such as Thailand. The hydrograph parameters are correlated to 4 measurable watershed characteristics including watershed area, length of main stream, length of the stream to the center of the watershed, and slope of the longest watercourse. Two simple empirical equations from regression analysis are presented for determination of hydrograph parameters, peak discharge, and time to peak, which can be used to derive the complete hydrograph. The method is suitable for use in the design of small hydraulic structures such as culverts and highway drainage which usually are constructed on an ungaged watershed. (Woodard-USGS)
W71-07632

EVALUATION OF THE STREAMFLOW DATA PROGRAM IN COLORADO,
Geological Survey, Denver, Colo.
Russell K. Livingston.
Geological Survey Open-file Report, Dec 1970. 72 p, 3 fig, 4 tab, 24 ref, 3 append.

Descriptors: *Streamflow, *Data collections, *Network design, *Colorado, Reviews, Evaluation, Project planning, Project purposes, Stream gages, Hydrologic data, Natural flow, Regulated flow, Regression analysis.
Identifiers: *Streamflow characteristics.

Colorado streamflow information was evaluated to assess the adequacy of the present program and to suggest modifications to improve the program. The ultimate objective is to provide adequate streamflow information at any point on any stream in Colorado. The basic steps in the evaluation were (1) classify streamflow information into four types of data -- current use, planning, and design, long-term trends, and stream environment, (2) define adequacy goals for each type of information, and (3) evaluate the program according to these goals. The results of the evaluation are as follows: (1) Goals for current use are being met. Ten gaging stations no longer needed are being discontinued. (2) Goals for planning and design are not being met. Eighteen additional gaging stations should be installed to provide better areal coverage of principal streams. (3) Goals to define long-term trends can be met by perpetual operation of 15 current gaging stations. (4) Goals on stream environment are not being met. These data are becoming increasingly important and warrant greater effort in the future. (Woodard-USGS)
W71-07634

A PROPOSED STREAMFLOW-DATA PROGRAM IN ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
For primary bibliographic entry see Field 07A.
W71-07636

HYDROLOGIC STUDIES AND COMPUTATIONS (GIDROLOGICHESKIYE ISSLEDOVANIYA I RASCHETY),
I. T. Krivosheyeva.
Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, 1969. 140 p.

Descriptors: *Discharge (Water), *Hydrologic data, *Regional analysis, *Runoff forecasting, *Hydrograph analysis, Discharge measurement, Runoff, River basins, Rainfall-runoff relationships, Statistical methods, River flow, Climatic data, Mathematical studies, Hydrographs, Computers, Inflow, Gaging stations, Flooding, Water balance, Groundwater recharge.
Identifiers: *Ukraine, Dnieper River, Dniester River, Carpathian Mountains, Danube River, Crimea.

This issue of the serial publication contains 14 articles, a number of which deal with methods used to compute maximum discharges from melt and rain waters. In several of the articles the 'Promin' computer is mentioned as a possible means of performing computations. A method for forecasting spring runoff from rivers of the Dniester Basin is advanced along with a method for studying asynchronous fluctuations in hydrometeorological phenomena by means of stochastic matrices. Considerable attention is paid to the formation conditions of dry-weather flow and the ice-heat regime, classification of torrential mudflows, and to the perfecting of an electrolytic method for measuring water discharges. (See also W71-07648 thru W71-07658) (Josefson-USGS)
W71-07647

USE OF THE 'PROMIN' COMPUTER FOR CALCULATING THE EFFECT OF A RIVER BASIN RESERVOIR ON MAXIMUM WATER DISCHARGES (RUSSIAN: OPYT PRIMENENIYA EVM 'PROMIN DLYA RASCHETA VLIYANIYA VODOKHRANILISHCHA V BASSEYNE REKI NA MAKSIMAL 'NYYE RASKHODY VODY),
T. A. Chekushkina.
In: Gidrologicheskiye isseldovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85, Gidrometeoizdat, Moscow, p 16-26, 1969. 10 p, 3 fig, 4 tab, 10 ref.

Descriptors: *Discharge (Water), *Reservoirs, *Hydrographs, *Hydrograph analysis, Time lag, River basins, Computers.
Identifiers: *Ukraine, Dnieper River, Travel time.

A method for computing high water discharges by taking into account the regulating effect of a reservoir is described. Over 50 rivers in the Dnieper Basin are examined for studying patterns in the increase of water basin areas according to river length and for analyzing the distribution of water basin areas based on this length. Discharges from a basin separated by a reservoir are represented as the sum of transformed discharges from an upper partial water basin, enclosed between the outlet and discharge site of a reservoir dam, and discharges from a lower partial water basin, removed from the dam to the outlet. Discharges from partial reservoirs are derived from a genetic runoff formula corrected by lag coefficients, which take into account the degree of transformation of discharge from sections between isochrones. A 'Promin' computer has been used to eliminate the drudgery of computations associated with computing hydrograph discharges. Nomograms have been prepared showing coefficients of decrease in maximum discharges from the basin as a whole and from the upper partial water basin as a function of time lag. (See also W71-07647) (Josefson-USGS)
W71-07648

CALCULATIONS OF HIGH WATER DISCHARGES ON THE 'PROMIN' COMPUTER (RASCHETY RASHHODOV POLOVOD'YA NA EVM 'PROMIN'),
V. I. Moklyak, and N. S. Snesareva.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85, Gidrometeoizdat, Moscow, p 27-29, 1969. 3 p, 1 tab, 1 ref.

Descriptors: *Discharge (Water), *Hydrographs, *Computers, *Hydrograph analysis, Time lag, Model studies, Reservoirs, Inflow, Regulated flow, Channel flow.
Identifiers: *Ukraine.

Hydrograph discharges were calculated on a computer by successive remultiplication of the ordinates of a unit hydrograph by the volume of inflow from an entire basin, by summing up partial discharges on the basis of their simultaneous lag. Discharges were calculated on the 'Promin' computer in two programs: 'Vesna-I' on six punch cards for determining the ordinates of the unit hydrograph and 'Vesna-II' on ten punch cards for determining discharges of the hydrograph. About 100 unit hydrographs, which took into account the varied duration of time lag and typical charts of basin width, were calculated on the 'Promin' computer. Charts of inflow were expressed by four models. About 400 hydrographs were prepared for determining the effect of hydrographic, meteorological, hydraulic, biological and other factors on high water discharge. (Josefson-USGS)
W71-07649

TYPICAL CHARTS OF UNIT INFLOW OF HIGH WATERS FROM LOWLAND RIVERS OF SOUTHWESTERN EUROPEAN USSR (KHARAKTERNYYE GRAFIKI ELEMENTARNOGO PRITOKA VYSOKIKH POLOVIDIY RAVNINNYKH REK YUGO-ZAPADA YEVROPEYSKOY TERRITORII SSSR),
Ya. A. Fomenko.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85, Gidrometeoizdat, Moscow, p 30-79, 1969. 50 p, 1 fig, 1 tab, 11 ref, append.

Descriptors: *River basins, *Melt water, *Inflow, *Hydrologic data, *Discharge (Water), Gaging stations, Hydrographs, Runoff, Runoff coefficient, Meteorology, Peak discharge.
Identifiers: *Ukraine, Dnieper River, Southern Bug River, Severskiy Donets River, Azov Sea, Balance method, Peak flow.

A unit inflow of melt waters from a basin into a channel system during high water periods is examined. The daily rate of unit inflow from small and average-size water basins is derived by the balance method by means of retransformation of recorded high water discharges. Data on daily inflow rate, its maximum and total value, duration of unit inflow and the ratio of peak to basin yield during high waters were determined from 244 gaging stations on lowland rivers of the Dnieper, Southern Bug, Severskiy Donets and Azov Sea Basins. Unit inflow charts expressed in percent may be used in hydrologic computations for constructing hydrographs of infrequently recurring spring high waters on the basis of a total runoff layer of given probability. A small daily difference in layers may be due simply to local characteristics of runoff formation, distribution of snow storage on the water basin or to inaccurate measurement of high water runoff. (See also W71-07647) (Josefson-USGS)
W71-07650

A METHOD FOR FORECASTING SPRING RUNOFF FROM RIVERS IN THE DNIESTER BASIN (METODIKA PROGNOZA VESENNEGO STOKA REK BASSEYNA DNESTRA),
A. V. Shcherbak.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 80-84, 1969. 5 p, 4 fig, 1 tab, 6 ref.

Descriptors: *Runoff, *Rainfall-runoff relationships, *Runoff forecasting, *Rivers, Snowmelt, Seasonal, Precipitation (Atmospheric), Statistical methods, Thawing, Water balance, Discharge (Water).
Identifiers: *Ukraine, Dniester Basin.

A study of spring runoff conditions for the Dniester River and several of its tributaries has revealed that there is a relationship between spring runoff and snow storage at the start of thaw and the amount of precipitation during a high water period. Despite a high correlation coefficient between snow storage at start of thaw and spring runoff (0.74), the amount of precipitation during the high water period is a major factor in the formation of runoff. In rivers of the mountain part of the basin, where the major share of Dniester spring runoff is formed, the rain component in high water runoff is 40-50%, increasing during individual years to 60-70%. The amount of snow storage and precipitation for partial water basins is determined by averaging the readings of stations located at these water basins or nearby. An index of average snow storage in the Dniester Basin to Mogilev-Podol'skiy and of precipitation during the high water period is determined as the weighted mean of these amounts, based on their participation in runoff, for the right and left banks of the basin. The closeness of the relationships obtained is quite sufficient for use in calculating and forecasting magnitude of spring runoff. (See also W71-07647) (Josefson-USGS)
W71-07651

A METHOD FOR STUDYING ASYNCHRONOUS FLUCTUATIONS IN HYDROMETEOROLOGICAL PHENOMENA BY STOCHASTIC MATRICES (RUSSIAN: METOD ISSLEDOVANIYA ASINKHRONNOSTI KOLEBANIY GIDROMETEOROLOGICHESKIKH YAVLENIY S POMOSHCH'YU STOKHASTICHESKIKH MATRITS),
M. M. Voronchuk, and Yu. V. Shveykin.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 92-98, 1969. 7 p, 2 fig, 7 ref.

Descriptors: *Stochastic processes, *Probability, *Fluctuation, *Meteorology, Computers, Runoff, Precipitation (Atmospheric).
Identifiers: *Ukraine, Danube River, Dnieper River.

A method is proposed for studying asynchronous fluctuations in hydrometeorological phenomena. It is based on comparing a matrix of the distribution of empirical probabilities of simultaneous appearance of specific values for two random variables and a matrix of the theoretical probabilities of a simultaneous appearance of the same values for these variables calculated from the assumption that the values under consideration vary independently of one another. Comparison and analysis of these matrices make it possible to determine the probabilities of a simultaneous appearance of any recorded values for these variables and to introduce a probability measure of the relationship of various values to these variables. The merit of this method lies in the possibility of studying simultaneous change in both homogeneous and heterogeneous variables as well as in the possibility of estimating the degree of their interrelationship. Because of the difficulty of computing elements of stochastic matrices, all calculations were performed on the 'Ural-4' computer, with the time required to compute one total probability of a matrix not exceeding 20-25 minutes. The example used for study was the asynchronous runoff from the Danube and Dnieper Rivers and the asynchronous runoff from the Dnieper together with precipitation in the irrigation zone. (See also W71-07647) (Josefson-USGS)
W71-07653

DRY-WEATHER FLOW OF TRANSCARPATHIAN MOUNTAIN RIVERS (RUSSIAN: MEZHENNY STOK GORNYKH REK ZAKARPAT'YA),
K. A. Lysenko, and L. K. Sinitskaya.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 99-103, 1969. 7 p, 2 fig, 1 tab, 2 ref.

Descriptors: *Runoff, *Low flow, *River flow, Rivers, Steady flow, Seasonal, Hydrogeology, Precipitation (Atmospheric), Meteorological data, Groundwater movement.
Identifiers: *Ukraine, Carpathian Mountains, Dry-weather flow, Regionalization.

An analysis of data for the low water period of Transcarpathian mountain rivers has revealed that there is a direct relationship between precipitation and runoff during a summer low water period. Maximum runoff values for a summer low water period (200-329 mm), lasting 100-140 days, were observed at the upper reaches of the Teresva and Tereblya Rivers and on the Belaya Tissa and Shopurka Rivers. For the other mountain rivers of Transcarpathia runoff values decreased in a west to southwest direction from 80-170 to 50-80 mm. Maximum runoff values for a winter low water period (60-129 mm), lasting 80-100 days, were typical of the mountain area, with runoff values decreasing gradually to 40-60 mm toward the foothills. Based on an established relationship between dry-weather flow and hydrogeological conditions, an attempt was made to determine the volume of runoff of a summer and winter low water period for rivers for which there were no runoff data. Two hydrogeological regions were distinguished within which the character of dry weather flow was identical to that of rivers for which there were hydrometric observation data. An analysis of runoff during low water periods revealed that there was considerable fluctuation in runoff owing to the varied extent to which the river valley incised underlying rock materials, draining of groundwater horizons into the river valley and to a diversified distribution of precipitation. (See also W71-07647) (Josefson-USGS)
W71-07654

HEAT REGIME CHARACTERISTICS OF RIVERS IN THE DANUBE AND DNIESTER BASINS (NEKOTORYYE OSOBENNOSTI TERMICHESKOGO REZHIM REK V BASSEYNAKH DUNAYA I DNESTRA),
N. G. Dyukel'.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Insitutu Trudy, No 85; Gidrometeoizdat, Moscow, p 104-111, 1969. 8 p, 4 fig, 4 tab, 5 ref.

Descriptors: *Heat balance, *Water temperature, *Base flow, *Groundwater recharge, Climatic data, Groundwater basins, River basins, Rivers.
Identifiers: *Ukraine, Danube River basin, Dniester River basin, Heat regime.

An analysis of the heat regime of rivers in the Danube and Dniester basins has established that heat regime characteristics differ for river reaches which have a moderate and high groundwater recharge. The heat regime for river reaches with an abundant groundwater outflow is determined more by the extent to which groundwaters participate in total runoff and by groundwater temperature than by climatic factors. The heat regime for river reaches with moderate groundwater recharge is determined by climatic characteristics, primarily air temperature. Since vertical zonality in distribution of air temperature is noted for Danube and Dniester basins, this zonality must be considered in the heat regime characteristics for river reaches with a moderate groundwater recharge. Vertical zonality in the distribution of the water temperature' of rivers in these basins makes it possible to establish relationships between heat regime characteristics (average long-term monthly water temperature values, dates of steady change in 0.2 deg increments in spring, and average rate of increase and decrease in water temperature values from month to month) and height of terrain. The relationship T—f (H) can be used to determine long-term average monthly water temperature values for rivers still unstudied. (See also W71-07647) (Josefson-USGS)
W71-07655

ESTIMATING THE EXTENT OF RIVER SLUSH ICE (K VOPROSU OB OTSENKE STEPENI SHUGONOSNOSTI REK),
N. G. Dyukel'.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 112-117, 1969. 6 p, 1 fig, 2 tab, 4 ref.

Descriptors: *Ice, *Ice jams, *Melting, *Thawing, *Seasonal, Rivers, River basins, Geomorphology, Hydrologic data.
Identifiers: *Slush ice, *Ukraine, Danube River, Dniester River, Southern Bug River, Carpathian Mountains.

The absence of quantitative descriptions of river slush ice necessitates finding indirect means of estimating slush ice formation because of its significant effect on normal operation of hydraulic structures. A very convenient index for estimating river slush ice is the number of ice jams recorded over the course of a winter on a certain reach of the river. In the mountain regions (Tissa and Prut River basins) conditions most favorable for intensive slush ice formation occur during very cold winters when the number of days with thaw periods is 50-60% of the norm. On rivers of the Dniester basin (a large part of which is in the Carpathian foothills) slush ice formation is most vigorous during near-normal winters when the number of days with thaw periods is 80-100% of the norm. On the lowland rivers of the Southern Bug basin Optimal conditions for formation of slush ice are created during normal winters when the number of days with thaws is 100-120% of the norm. The extent of slush ice formation and optimal conditions for its formation on rivers in the area examined can be determined from graphs showing the relationship between the number of ice jams per winter and the severity of the season. (See also W71-07647) (Josefson-USGS)
W71-07656

CLASSIFICATION AND REGIONALIZATION OF TORRENTIAL MUDFLOWS IN THE UKRAINIAN CARPATHIANS (KLASSIFIKATSIYA SELEY I RAYONIROVANIYE BASSEYNOV SELEOPASNYKH REK UKRAINSKIKH KARPAT),
M. M. Ayzenberg, M. L. Vol'ftsun, and Ye. V. Khloyeva.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 118-124, 1969. 7 p, 1 fig, 1 tab, 23 ref.

Descriptors: *Mudflows, *Sediments, *Erosion, *Regional analysis, *Sediment-water interfaces, Flooding, Flash floods, Orography, Alluvium, Petrography, Rocks, Particle size, Runoff, Vegetation.
Identifiers: *Ukraine, *Torrents, *Torrential flow, Carpathian Mountains.

Studies made in 1965-1967 of Carpathian Mountain river mud basins and torrential mudflows have suggested a new classification scheme for these mud basins. The new scheme takes into account the physico-geographic characteristics of the basins (altitude, plant cover, rocks, mud-fraction composition), maximum surface runoff, mudflow density and maximum amount of alluvium (considering the entire and denuded area of water basin), loss of alluvium by mudflow and the most probable type of torrential mudflow. Three categories of mudflow are differentiated for these basins: heavy, medium and light. Based on physico-geographic characteristics the Ukrainian Carpathians are divided into 3 mudflow areas--the northwestern, southwestern and southeastern--with a further division into subareas. A list of principal mud-laden rivers for each subarea is indicated along with the years in which mudflows were most frequently observed. (See also W71-07647) (Josefson-USGS)
W71-07657

DETERMINING WATER DISCHARGE BY ELECTROLYSIS WITHOUT FIELD CALIBRATION OF ELECTRODES (OPREDELENIYE RASKHODOV VODY ELEKTROLITICHESKIM SPOSOBOM BEZ POLEVOY TARIROVKI ELEKTRODOV),
N. V. Pikush.
In: Gidrologicheskiye issledovaniya i raschety, Ukrainskiy Nauchno-Issledovatel'skiy Gidrometeorologicheskiy Institut Trudy, No 85; Gidrometeoizdat, Moscow, p 130-134, 1969. 5 p, 3 fig, 1 tab, 3 ref.

Descriptors: *Electrolysis, *Discharge measurement, *Discharge (Water), Electrodes, Calibrations, Mathematical studies.
Identifiers: *Ukraine, Water electroconductivity.

Further study was made of the technical characteristics of an electrolyte water discharge gage and of the properties of a saturated water solution of common table salt. To determine water discharge by the electrolytic method without recourse to field calibration of electrodes, the following method was used. A saturated water solution of common table salt was prepared by pouring any grade of salt into a vessel and adding 1 liter of water for every 400 g of salt. After repeated mixing the solution was left to stand for at least 20 minutes until completely clear. During this time electrodes were properly secured, the instrument adjusted and water temperature and water level measured. Then, following usual procedures, the volume of solution introduced to the current was precisely measured and observations made during the entire period of passage of the ion cloud across the electrode alignment for electrolytic measurement of water discharge. By using this method, water discharges by electrolytic means were determined more rapidly and with greater accuracy. (See also W71-07647) (Josefson-USGS)
W71-07658

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07661

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR).
For primary bibliographic entry see Field 04A.
W71-07689

2F. Groundwater

DETERMINATION OF IN SITU HYDRAULIC PARAMETERS IN JOINTED ROCK,
Imperial Coll. of Science and Technology, London (England).
C. Louis, and Y. N. Maini.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 1, No 32, Belgrade, Yugoslavia, Sept 1970. 11 p, 9 fig, 16 ref.

Descriptors: *Rocks, *Joints (Geology), Fissures, *Permeability, Pumping tests (Wells), Field tests, Test procedures, Bibliographies, *Hydraulic conductivity, *Groundwater flow, Groundwater movement, Groundwater geology, Geology.

The theory of waterflow through jointed rock has undergone rapid advancement in recent years. Digital and analog computers can now be applied to very large 2- and 3-dimensional problems, but the application of these methods is completely inadequate if no in situ hydraulic parameters are available. Most field test interpretation is based on the classical soil mechanics theory of flow through a continuum, and consequently leads to incorrect results in jointed rock. The rock is assumed to be divided by several sets of parallel joints. The problem of determining the rock mass hydraulic parameters is dealt with theoretically. Field testing requirements include either a pumping test (pumping into or out of a borehole or gallery) or a dilution test. Practical suggestions regarding the performance of these tests in the field are given. Has 16 references. (USBR)
W71-07075

ANALYSIS AND EVALUATION OF PUMPING TEST DATA,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands); and Institute for Land and Water Management Research, Wageningen (Netherlands).
G. P. Kruseman, and N. A. De Ridder.
International Institute for Land Reclamation and Improvement, Bulletin 11, 1970. 200 p, 29 tab, 55 ref, 61 fig, 175 equations.

Descriptors: *Aquifers, *Pumping, *Analytical techniques, *Hydrologic equation, *Hydraulics, Testing, Aquifer characteristics, Permeability, Transmissivity, Storage coefficient, Hydrologic properties, Hydraulic models, Test procedures, Drawdown, Artesian wells, Evaluation, Data processing, Groundwater, Darcy's Law, Steady flow, Unsteady flow, Dewatering, Boundaries (Surfaces), Anisotropy, Approximation method.
Identifiers: Variable discharge.

This is a guidebook for analyzing and evaluating pumping test data. Pumping tests help assess the groundwater resource, the major water source in arid and semi-arid lands. The introduction gives definitions and discusses Darcy's law, aquifer types, hydraulic properties and types of flow equations. General set-up, performance and data analysis of pumping tests are described. Chapter three gives methods of analyzing steady-state and unsteady-state flow in confined, semi-confined and unconfined aquifers, and unsteady-state flow in unconfined aquifers with delayed yield and in semi-unconfined aquifers (Boulton's method). Chapter four presents methods of analyzing the special cases of aquifers limited by one or more boundaries, anisotropic aquifers, wedge-shaped aquifers, sloping aquifers, aquifers pumped at a variable discharge rate, partially penetrated aquifers, aquifers pumped by a large diameter well, two-layered semi-confined aquifers, approximation methods and free flowing wells. Corrections and unit conversions are discussed. Examples of method application are given. There are 11 well-function tables, and 18 tables of empirical, and conversion data. (Popkin-Arizona)
W71-07166

CHARACTERIZATION OF WATER TABLES IN OREGON SOILS WITH REFERENCE TO TRAFFICABILITY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. Boersma, and G. H. Simonson.
Sponsored by US Army Materiel Command; prepared under contract with Department of Soils, Oregon State University, Corvallis, Oregon. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Contract Report M-70-1, May 1970. 2 vols--Vol I: Data, 235 p; Vol II: Analysis, 108 p. 1T021701A046 and 1V025001A131, Task 02.

Descriptors: *Water table, *Soil moisture, *Trafficability, *Soil strength, *Soil tests.
Identifiers: *Oregon soils.

Three near-model test sites were established on each of five soil series of the Willamette Catena in western Oregon. Field and laboratory tests on soils from 15 test sites were initiated in the fall of 1963 and terminated in summer of 1965. Objectives of study were to (1) determine whether particular water table regimes are associated with specific soil types, (2) achieve the capability for appraising water table regimes from soil morphological information, and (3) gain background knowledge needed in the development of prediction methods for water table depths, soil moisture contents, and soil strengths. Data obtained daily at each site included maximum and minimum air temperatures, precipitation, groundwater depths, and electrical

resistance measurement of soil moisture content and temperature. Data obtained periodically included gravimetric soil moisture contents, soil strengths, and the state of the ground and vegetation. Data on Atterberg limits, grain-size distributions, specific gravities, organic matter contents, moisture contents at specified tensions, dry densities, site descriptions, and soil profile descriptions have been condensed and presented in tabular and graphic form. Analysis of data is presented in Vol II. (Spivey-WES)
W71-07173

GROUNDWATER POLLUTION FROM SANITARY LANDFILLS AND REFUSE DUMP GROUNDS, A CRITICAL REVIEW,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05E.
W71-07194

HYDROLOGIC RECONNAISSANCE OF THE SINK VALLEY AREA, TOOELE AND BOX ELDER COUNTIES UTAH,
Geological Survey, Salt Lake City, Utah.
Don Price, and E. L. Bolke.
Utah Department of National Resources Technical Publication No 26, 1970. 34 p, 3 fig, 1 plate, 8 tab, 12 ref.

Descriptors: *Groundwater basins, *Water resources, *Hydrogeology, *Deserts, *Utah, Groundwater, Water balance, Water quality, Hydrologic data, Data collections, Recharge, Discharge (Water).
Identifiers: Sink Valley (Utah).

The Sink Valley (Puddle Valley) area covers about 330 square miles between Great Salt Lake and the Great Salt Lake Desert in northwestern Utah. It is a dry, sparsely populated area utilized partly as a military reservation and partly as winter range for sheep. Normal annual precipitation in the area ranges from less than 6 inches in the lowlands to a maximum of about 12 inches in the mountains. Because of a high potential evaporation (estimated to be about 58 inches a year), there is virtually no overland runoff from the area and very little groundwater recharge. All streams in the area are dry most of the year. The principal source of water is groundwater that occurs chiefly under water table conditions in unconsolidated and partly consolidated Quaternary and Tertiary valley fill. Sand and gravel aquifers in the valley fill yield as much as a few hundred gallons of water per minute to wells. However, the water generally contains more than 2,000 mg/liter of dissolved solids, and mineral content of the water increases with depth. The principal dissolved constitutents generally are sodium and chloride. In 1967, about 37 acre-feet of water was pumped and demineralized for domestic supply at the Hill Air Force Range. An average of about 1.5 acre-feet per year is pumped for stock. The annual recharge is about 1,000 acre-feet. Natural discharge from the reservoir, which occurs entirely as subsurface outflow, is also about 1,000 acre-feet per year. The small quantity and the poor quality of the water are the principal limiting factors in any major development of water resources in Sink Valley and the adjacent areas. (Knapp-USGS)
W71-07244

WATER RESOURCES OF THE BELMONT-MARTHAVILLE-ROBELINE AREA, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02E.
W71-07246

ON THE QUESTION OF THE ORIGIN OF THE GASTEIN THERMAL WATERS, (ZUR FRAGE DER HERKUNFT DES GASTEINER THERMALWASSERS),
Innsbruck Univ. (Austria). Balneology Inst.; and Society of Hydrogeological Scientists, Graz (Austria).
C. Job, and J. Zotl.
Steirische Beitrage Zur Hydrogeologie, Graz, 1969, (Separate printing). 115 p, 19 fig, 11 tab, 33 ref.

Descriptors: *Thermal water, *Mineral water, *Hot springs, *Water circulation, Provenance, Water chemistry, Mineralogy, Tracers, Radioisotopes, Stable isotopes, Recharge, Discharge (Water), Water yield.
Identifiers: *Gastein (Austria), *Austria.

The cold waters of the Gastein area do not penetrate deep into the mountainous body and run off close to the surface, and are simple Ca-bicarbonate waters. As the depth of infiltration increases, sulfates created by the oxidation of sulfidic ores become predominant, and the Na-content of the waters increases by Ca/Na-exchange; the water in deep situated joints then contains all the ions typical of the Gastein thermal waters, except the chlorides. Chemical content as well as tritium content showed that springs may increase their yield by increased hydrostatic pressure in the recharge area. There is also fluctuating discharge of the pure deep thermal waters. The delta C-14 values of the carbonates of the hot waters closely approach the ideal value for vadose waters, from which it may be concluded that biogenic CO2 took an essential part in the dissolution of these carbonates and that, therefore, the main body of the Gastein thermal waters is infiltrated precipitation water. This result is confirmed by the C-14 analyses. (Knapp-USGS)
W71-07252

A PROBLEM OF SUBSIDENCE IN A LIMESTONE TERRANE AT COLUMBIANA, ALABAMA,
Geological Survey, University, Ala. Water Resources Div. and Geological Survey of Alabama, University.
W. J. Powell, and P. E. LaMoreaux.
Alabama Geological Survey Circular 56, 1969. 30 p, 22 fig, 1 ref.

Descriptors: *Land subsidence, *Withdrawal, *Limestones, *Alabama, Aquifers, Subsidence, Karst, Faults (Geology), Pumping, Municipal water, Water yield, Aquifer characteristics, Carbonate rocks.
Identifiers: *Columbiana (Ala).

The effects and possible causes of subsidence at Columbiana, Alabama, were studied to aid in suggesting a means of preventing further subsidence in the area. The subsidence damaged several buildings, a Federal housing project, endangered the concrete filter plant and elevated water storage tank, broke water lines, and severed the tracks of the Louisville and Nashville Railroad. The area most seriously affected by subsidence was at the site of the municipal water filter plant. Subsidence is common in areas underlain by limestone. At Columbiana, most of the subsidence was confined to the material above the limestone in a zone consisting of clay, shale, slate, sand, and gravel, and occurred in an area adjacent to the trace of the Wilsonville fault. Removal of silt, sand, calcareous and colloidal material by groundwater movement reduced the bearing strength of the overlying material. Continuous pumping from municipal wells 1 and 2 has created a cone of depression in the groundwater reservoir causing groundwater to move from all sides of this depression toward the center. The sediment present in the muddy water pumped from municipal wells 1 and 2 evidently is material removed primarily from the zone above bedrock. Development of 2 municipal wells at Kewahatchie Spring about 8 miles southeast of Columbiana will alleviate the water shortage and help alleviate subsidence. If pumping is continued from wells 1 or 2, even on a temporary basis, additional subsidence could be triggered. Surface cracks, particularly in the vicinity of well 2, should be filled. (Knapp-USGS)
W71-07253

A SIMPLE METHOD OF GROUNDWATER DIRECTION MEASUREMENT IN A SINGLE BORE HOLE,
Irrigation Research Inst., Lahore (Pakistan).
Mohammad Saleem.
Journal of Hydrology, Vol 12, No 4, p 387-410, Mar 1971. 24 p, 11 fig, 2 ref, 2 append.

Descriptors: *Groundwater movement, *Tracers, *Tracking techniques, *Water wells, Aquifers, Flow, Porous media, Boreholes, Subsurface investigations.
Identifiers: *Groundwater tracing.

A simple tracer technique may be used to find both the magnitude and direction of groundwater flow in a single borehole sited in a pervious water bearing medium. At any given horizon where velocity measurements are required, the strainer of the borehole is divided into three regions, each about 10 cm long. The central region has slits all around. The top region consists of two equal semicircular halves, each subtending an angle of 180 degrees at the axis of the strainer, and one-half has slits cut in it as usual while the second half is kept completely closed. The lower region is similarly constructed to the top one except that its reference line leads or lags behind the reference line of the top region by an angle of 45 degrees. For proper separation of these three regions, there are buffer zones between any two consecutive regions. Inactive potassium bromide solution is injected in all the three regions. Using three independent brass electrodes, one in each of the three regions, electrical conductivities at regular intervals of time are carried out by using low frequency and low voltage alternating current, the common electrode being the strainer itself. The magnitude of flow can be determined from the information collected from the central region; the data from the top and lower regions give the direction of flow. (Knapp-USGS)
W71-07269

DIGITAL COMPUTER SOLUTIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton, and L. M. Tomlinson.
Journal of Hydrology, Vol 12, No 4, p 339-362, Mar 1971. 24 p, 11 fig, 1 tab, 8 ref, 2 append.

Descriptors: *Groundwater movement, *Numerical analysis, *Computer programs, Hydrogeology, Flow, Porous media, Recharge, Infiltration, Withdrawal, Networks, Digital computers, Mathematical models, Model studies, Analog models.
Identifiers: Implicit methods.

This paper examines critically the use of the alternating direction implicit method for solving groundwater flow problems. Comparisons with alternative solutions show that inaccuracies can arise if the time increments are too large. A method is suggested whereby the computer chooses an optimum time increment. The representation of recharge, infiltration and wells is considered and a detailed example compares the alternating direction implicit, the explicit and the resistance-capacitance network methods. (Knapp-USGS)
W71-07273

TWO DIMENSIONAL HEAT TRANSFER IN POROUS MEDIA WITH STEADY-STATE WATER FLOW,
California Univ., Davis. Dept. of Water Science and Engineering.
K. T. Erh, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 35, No 2, p 209-214, Mar-Apr 1971. 6 p, 12 fig, 1 tab, 18 ref.

Descriptors: *Heat transfer, *Soil water movement, *Porous media, Clays, Saturated flow, Conduction, Diffusion, Heat flow, Mass transfer, Thermal conductivity, Instrumentation, Laboratory tests, Mixing, Water temperature.

Identifiers: Apparent thermal conductivity.

Theoretical and experimental temperature distributions were examined for laboratory columns of Hanford sandy loam, Panoche clay loam, and Aiken clay saturated with water flowing at a constant rate. The temperature of the water entering the columns was kept below or above the ambient temperature for several values of soil water velocity. Temperature distributions were predicted as a function of flow velocity, radial size, apparent thermal conductivity, and the wall heat transfer coefficient of the cylindrical container for the soil. Values of the apparent axial and radial thermal conductivity depend upon the flow velocity at values less than 0.3 cm per min with only one exception. The value of the axial thermal conductivity was 1.1 greater than that of the radial thermal conductivity for all soils and flow velocities. Increasing the soil column radius had the same effect on the temperature distributon as increasing the water velocity. (Knapp-USGS)
W71-07279

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1970,
Geological Survey, Albuquerque, N. Mex.
For primary bibliographic entry see Field 02E.
W71-07284

WATER LEVELS IN ARTESIAN AND NONARTESIAN AQUIFERS OF FLORIDA, 1967-68,
Geological Survey, Tallahassee, Fla.
Henry G. Healy.
Florida Bureau of Geology Information Circular No 68, 1971. 61 p, 51 fig, 1 tab.

Descriptors: *Florida, *Aquifers, *Groundwater, *Artesian wells, *Hydrologic data, Water level fluctuations, Hydrographs, Observation wells, Precipitation (Atmospheric), Rainfall, Chlorides, Confined water, Data collections.
Identifiers: Groundwater data (Fla).

This report summarizes the trends and fluctuations of groundwater levels in the principal aquifers in Florida during 1967-68 and includes: (1) hydrographs of groundwater levels in the several aquifers; (2) maps showing changes in groundwater levels during specific periods; and, (3) a table summarizing the principal data on selected observation wells. The locations, aquifers, and types and periods of records available for 3,600 observation wells are tabulated. (Josefson-USGS)
W71-07285

GROUNDWATER RESOURCES OF ARANSAS COUNTY, TEXAS,
Geological Survey, Austin, Tex.
G. H. Shafer.
Published and distributed by the Texas Water Development Board, PO Box 13087, Austin, Texas 78711. Texas Water Development Board Report 124, Dec 1970. 81 p, 22 fig, 10 tab, 32 ref.

Descriptors: *Water resources development, *Groundwater, *Hydrogeology, *Hydrologic data, *Texas, Data collections, Water resources, Aquifers, Aquifer characteristics, Water levels, Water level fluctuations, Water yield, Water wells, Water quality, Salinity, Consumptive use, Chemical analysis, Irrigation, Industrial water, Domestic water.
Identifiers: *Aransas County (Tex).

The aquifers that yield water to wells in Aransas County, Texas are the Gulf Coast aquifer, mostly of Pliocene and Pleistocene age, that underlies the entire county; the Pleistocene barrier island and beach deposits, which are restricted to the peninsulas; and the Holocene barrier island deposits, which are restricted to St. Joseph Island. Almost all groundwater needed for public supply and industrial use is obtained from the Gulf Coast aquifer that underlies Live Oak Peninsula. During 1966, about 1,600 acre-feet of groundwater was pumped for all purposes in the county. About 672 acre-feet was for public supply, 342 acre-feet for industrial use, and 580 acre-feet for rural domestic and livestock use. One of the principal factors limiting the development of moderate supplies of groundwater is the threat of salt-water intrusion from sands underlying the fresh-water zone. The most satisfactory method of disposal of salt water is by the use of injection wells, but in 1961 only 500 barrels (0.06 acre-foot) of salt water produced from oil wells in Aransas County was disposed by this method. (Woodard-USGS)
W71-07292

GROUNDWATER IN ONTARIO, SOUTH-EASTERN AREA, 1960 TO 1964.
Ontario Water Resources Commission, Toronto. Div. of Water Resources.

Ontario Water Resources Commission, Water Resources Bulletin 2-8, Groundwater Series, 1970. 307 p, 2 fig, 8 tab, 4 append.

Descriptors: *Water resources, *Groundwater, *Hydrologic data, *Data collections, Water wells, Geology, Aquifers, Aquifer characteristics, Hydrology, Topography, Meteorology, Drainage, Hydrogeology, Water sources, Water level fluctuations, Observation wells, Water utilization, Water resources development.
Identifiers: *Ontario (Canada), Well logs, Well data.

This report contains groundwater information assembled for the southeastern area of Ontario for the period 1960 to 1964. The information is directed to individuals interested in groundwater conditions in areas where they wish to drill wells; by drillers who are interested in hydrogeologic conditions in areas other than where they normally operate; by town planners, engineers, and geologists, who are searching for major aquifers to supply municipalities with groundwater; and by engineers, geologists and others who are seeking favorable sites for gravel pits, quarries, or other deposits of economic value. The western part of the area mainly in the counties of Renfrew and Frontenac and partly in the counties of Leeds and Lanark, is underlain predominantly by Precambrian rocks and the topography is quite variable. The elevation varies from an altitude of about 240 feet at the St. Lawrence River near Brockville, to a height of 1,725 feet above sea level southeast of Killaloe Station. In the eastern part of the area the land is underlain by Paleozoic rocks. Here, the elevation varies from an altitude of 73 feet at the Ottawa River at the eastern edge of the Province to a height of 480 feet near the Hamlet of Algonquin in the head waters of the South Nation River. The observation wells (78) are listed by county. Well descriptions and water-level measurements are given. (Woodard-USGS)
W71-07295

GROUNDWATER OF SOUTHEASTERN VIRGINIA.
Virginia Dept. of Conservation and Economic Development, Charlottesville. Water Resources Div.

Virginia Division Water Resources Planning Bulletin, 262, 1970. 54 p, 25 plates, 2 tab, 37 ref.

Descriptors: *Water resources development, *Virginia, Groundwater, Water yield, Aquifers, Recharge, Water management (Applied), Planning, Water levels, Water table, Withdrawal.
Identifiers: Southeastern Virginia.

Groundwater in southeastern Virginia is obtained from both water table and artesian aquifers. The deep artesian system is the principal source of water. Pumpage has increased, principally in the Franklin area, from about one mgd in 1939 to about 46 mgd in 1969, and now is exceeding natural replenishment. Other cones of depression are developing. A continuing overdraft may result in serious groundwater supply difficulties in southeastern Virginia, and recommendations are offered to deal with the problem. (Knapp-USGS)
W71-07298

SELECTED HYDROLOGIC DATA, CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Salt Lake City, Utah.
For primary bibliographic entry see Field 07C.
W71-07303

EVALUATION OF THE QUANTITY AND QUALITY OF THE WATER RESOURCES OF VOLUSIA COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02E.
W71-07599

DERIVATION OF BASE FLOW RECESSION CURVES AND PARAMETERS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 02E.
W71-07623

EFFECT OF SOIL MOISTURE HYSTERESIS ON THE WATER TABLE PROFILE AROUND A GRAVITY WELL,
Nevada Univ., Reno. Plant, Soil, and Water Science Div. and California Univ., Davis. Dept. of Water Science and Engineering.
J. C. Guitjens, and James N. Luthin.
Water Resources Research, Vol 7, No 2, p 334-346, Apr 1971. 13 p, 8 fig, 2 tab, 21 ref, 3 append.

Descriptors: *Hysteresis, *Soil water movement, *Drawdown, *Water table, *Water level fluctuations, Withdrawal, Surface-groundwater relationships, Infiltration, Seepage, Recharge, Soil moisture, Specific capacity, Time lag, Aquifer characteristics, Groundwater movement.
Identifiers: *Soil moisture-groundwater relations, *Gravity wells.

Gravity wells, pumped intermittently, can have different degrees of drainage in the unsaturated zone at the onset of water table recovery. Each part of the aquifer profile follows a specific curve of rewetting. Measured hysteresis of fine sand and hydraulic conductivity as a function of moisture content are incorporated in the partial differential equations for steady and unsteady radial flow to solve for the soil moisture pressure distribution of water table drawdown and three different kinds of recovery. The method of independent domains describes hysteresis and accounts for a gradual release and uptake of water rather than constant changes based on the concept of specific yield. Small differences between the computed values of the three water table recoveries, each one starting at a different degree of drainage in the zone above the water table, are probably due to the relatively small unsaturated portion of the aquifer profile. (Knapp-USGS)
W71-07626

THREE-DIMENSIONAL, TRANSIENT, SATURATED-UNSATURATED FLOW IN A GROUNDWATER BASIN,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
R. Allan Freeze.
Water Resources Research, Vol 7, No 2, p 347-366, Apr 1971. 20 p, 11 fig, 34 ref.

Descriptors: *Groundwater basins, *Hydrogeology, *Mathematical models, *Simulation analysis, *Numerical analysis, Groundwater movement, *Aquifers, Surface-groundwater relationships, Saturated flow, Rainfall-runoff relationships, Water yield, Safe yield, Computer programs, Water levels, Hydraulic gradient, Unsteady flow, Base flow, Water balance.
Identifiers: Transient flow.

A three-dimensional finite difference model was developed for the treatment of saturated-unsaturated transient flow in small nonhomogeneous, anisotropic geologic basins. The model includes the unsaturated zone in a basin-wide model that can also handle both confined and unconfined saturated aquifers, under both natural and developed conditions. The integrated equation of flow is solved by the line successive overrelaxation technique. The model allows any generalized region shape and any configuration of time variant boundary conditions. When applied to natural flow systems, the model provides quantitative hydrographs of surface infiltration, groundwater recharge, water table depth, and base flow. Results of simulations for hypothetical basins provide insight into the mechanisms involved in the development of perched water tables. The unsaturated basin response is the controlling factor in determining the nature of the base flow hydrograph. Application of the model to developed basins allows simulation of the manner in which groundwater withdrawals are transmitted through the aquifers, and the changes in the rates of groundwater recharge and discharge induced by the withdrawals. For any proposed pumping pattern, it is possible to predict the maximum basin yield that can be sustained by a flow system in equilibrium with the recharge-discharge characteristics of the basin. (Knapp-USGS)
W71-07627

QUASILINEARIZATION AND THE IDENTIFICATION OF AQUIFER PARAMETERS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 06A.
W71-07628

ONE-DIMENSIONAL GRAVITY DRAINAGE OF UNIFORM COLUMNS OF POROUS MATERIALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 02G.
W71-07629

GROUNDWATER CONDITIONS IN SOUTHERN UTAH VALLEY AND GOSHEN VALLEY, UTAH,
Geological Survey, Salt Lake City, Utah.
R. M. Cordova.
Copies of report available at Utah Dept of Natural Resources, Division of Water Rights, 442 State Capitol, Salt Lake City, Utah. Utah Department of Natural Resources Technical Publication No 28, 1970. 79 p, 29 fig, 4 plate, 14 tab, 20 ref.

Descriptors: *Groundwater, *Aquifers, *Water resources, *Groundwater recharge, *Utah, Wells, Artesian wells, Water balance, Irrigation, Water level fluctuations, Evapotranspiration, Seepage, Sewage disposal, Subsurface flow, Water resources development, Groundwater basins.
Identifiers: Groundwater temperature, Chemical quality, Central Utah Project, Utah Valley, Goshen Valley (Utah).

The valley fill in southern Utah Valley and Goshen Valley includes four main aquifers--a water-table aquifer and three artesian aquifers. The minimum estimate of recharge in 1966 was 150,000 acre-feet. The minimum estimate of discharge in 1966 was 220,000 acre-feet of which about 29,000 acre-feet was withdrawn from storage in the aquifer. Important factors that should be considered in managing the groundwater reservoir include increased withdrawal of water from wells, wastage of water from flowing wells, saltcedar infestation, sewage disposal, and the Central Utah Project. A quantitative evaluation of the actual effects of operating the Central Utah Project can be made only by a comprehensive water-resources study of the entire Utah Lake Valley. (Josefson-USGS)
W71-07637

HEAT REGIME CHARACTERISTICS OF RIVERS IN THE DANUBE AND DNIESTER BASINS (NEKOTORYYE OSOBENNOSTI TERMICHESKOGO REZHIM REK V BASSEYNAKH DUNAYA I DNESTRA),
For primary bibliographic entry see Field 02E.
W71-07655

THE SAN FERNANDO, CALIFORNIA, EARTHQUAKE OF FEBRUARY 9, 1971.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07659

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07661

2G. Water in Soils

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
H. M. Taylor, and Larry F. Ratliff.
Soil Science, 1969, Vol 108, No 2, p 113-119. 8 fig, 2 tab, 6 ref.

Descriptors: *Cotton, *Peanuts, *Soil strength, *Moisture content, *Root development, Resistance, Soil moisture, Soil-water-plant relationships, Plant growth, Root distribution.
Identifiers: *Soil-water potential, Penetrometer, Soil suction, Matric suction.

This research investigates the soil water content and soil matric suction effects on root elongation rates. Cotton and peanut root elongation rates decreased as soil strengths increased. Soil strengths were measured with a penetrometer. The relation between elongation rate and penetrometer resistance was not affected by 0.17 to 7.0 bars soil suction for cotton and 0.19 to 12.5 bars for peanuts. Root diameter increased with soil water content, particularly at low soil strengths. Figures and tables relate penetrometer resistance, root length, soil moisture, and time for cotton and peanut roots. (Popkin-Arizona)
W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.
For primary bibliographic entry see Field 03F.
W71-07158

WATER DYNAMICS IN CLAYS BY NEUTRON SPECTROSCOPY,
Sydney Univ. (Australia). Dept. of Physical Chemistry.
R. J. Hunter, G. C. Stirling, and J. W. White.
Nature Physical Science, Vol 230, No 17, p 192-194, Apr 26, 1971. 3 p, 2 fig, 11 ref.

Descriptors: *Groundwater movement, *Clays, *Water chemistry, *Neutron activation analysis, *Spectroscopy, Soils, Soil dynamics, Analytical techniques, Soil water movement.

The behavior of water near solid surfaces is of current interest and, in particular, much attention has been paid to the water-clay interaction in layered alumino silicates. Experimental results show that neutron spectroscopy can be a valuable method for elucidating the behavior of water molecules very close to solid surfaces, with layered silicate structures providing a particularly useful model system in which the thicknesses and other properties of the water films can be precisely controlled. (Woodard-USGS)
W71-07264

SOIL STRUCTURE AND HYDRAULIC CONDUCTIVITY OF ADJACENT VIRGIN AND CULTIVATED PEDONS AT TWO SITES: A TYPIC ARGIUDOLL (SILT LOAM) AND A TYPIC EUTROCHREPT (CLAY),
Wisconsin Univ., Madison. Geological and National History Survey; and Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma, and F. D. Hole.
Soil Science Society of America Proceedings, Vol 35, No 2, p 316-319, Mar-Apr 1971. 4 p, 1 fig, 1 tab, 15 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Soil structure, *Soil management, Cultivation, Cultivated lands, Soil physics, Soil horizons, Soil types.

Soil morphology and hydraulic conductivity (K) of principal soil horizons of paired virgin and cultivated soil pedons were studied at two sites: a Tama silt loam (Typic Argiudoll) and an Oshkosh clay (Typic Eutrochrept). About a century of cultivation had led to reduction of K (measured by the Bouwer double-tube method) in the upper part of the solum below the Ap. Corresponding changes in soil morphology are noted. The reductions in K are paralleled by increases in bulk density and decreases in porosity and organic matter content in the soil horizons. At a depth of 80 to 90 cm in the clay soil, K increased apparently as a result of formation of interpedal voids as the alfalfa crop (Medicago sativa L.) extracted moisture. (Knapp-USGS)
W71-07274

PHYSICO-CHEMICAL PROPERTIES OF SOLS AND GELS OF Na-MONTMORILLONITE WITH AND WITHOUT ADSORBED HYDROUS ALUMINUM OXIDE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
Brian G. Davey, and Philip F. Low.
Soil Science Society of America Proceedings, Vol 35, No 2, p 230-236, Mar-Apr 1971. 7 p, 7 fig, 31 ref.

Descriptors: *Gels, *Montmorillonite, *Water chemistry, *Adsorption, Clay minerals, Ion exchange, Soil chemical properties, Mineralogy, Soil strength.
Identifiers: Sols.

Sodium-montmorillonite was prepared with and without adsorbed hydrous aluminum oxide. The two clays were mixed with NaCl solution in different proportions. The clay content at which gelation began, as indicated by an increase in viscosity and the initiation of non-Newtonian and hysteretic behavior, was lower for the Na/Al-clay than for the Na-clay. Theoretical considerations indicated that both strong and weak bonds were present in the sols. Specific heat capacities were found to differ from those calculated from the known proportions and specific heat capacites of clay and water. Differences were greater for the Na/Al- than for the Na-clay. These differences could be attributed to clay-water interaction. The relative partial molar free energy of NaCl changed with clay content in somewhat different ways for the Na/Al- and Na-clay mixtures. Adsorbed hydrous aluminum oxide influence the physico-chemical properties of sols and gels of Na-montmorillonite. (Knapp-USGS)
W71-07275

MEASURING SOIL MATRIC POTENTIAL IN SITU BY SENSING HEAT DISSIPATION WITHIN A PROUS BODY: II. EXPERIMENTAL RESULTS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
C. J. Phene, S. L. Rawlins, and G. J. Hoffman.
Soil Science Society of America Proceedings, Vol 35, No 2, p 225-229, Mar-Apr 1971. 5 p, 4 fig, 8 ref.

Descriptors: *Soil moisture meters, *Heat transfer, *Moisture tension, Pore pressure, Soil water, Soil moisture, Instrumentation, Telemetry.
Identifiers: *Matric potential, *Psychrometers.

A sensor designed to measure the matric potential of soil water in situ was tested in soil-plant systems. In the field, temperatures obtained by the sensor were used to predict optimum time for measurement to avoid error caused by diurnal temperature drift in the soil. The error caused by temperature drift was eliminated completely by using two matched diode sensors and taking a temperature difference measurement. The accuracy of the matric potential sensor proved to be as good as or better than that of other techniques used to measure matric potential. Sensors with high sensitivity in the 0 to -2 bar matric potential range had an accuracy of 0.2 bar. The accuracy decreased progressively to 1 bar at a matric potential of -10 bars. (Knapp-USGS)
W71-07276

SOIL-WATER HYSTERESIS: THE DOMAIN THEORY EXTENDED TO PORE INTERACTION CONDITIONS,
Department of Agriculture, Ottawa (Ontario). Soil Research Inst.
G. C. Topp.
Soil Science Society of America Proceedings, Vol 35, No 2, p 219-225, Mar-Apr 1971. 7 p, 10 fig, 13 ref.

Descriptors: *Wetting, *Soil water movement, *Hysteresis, Porous media, Infiltration, Percolation.
Identifiers: Independent domain theory.

Some inadequacies of the independent domain theory of hysteresis were overcome by modifying an extension to the theory to include two types of pore interactions. In the independent domain theory only the shapes of the pores determined the draining and filling characteristics of each pore. In this extension to the theory, the draining and filling of each pore depends on the state of neighboring pores as well as the pore geometry. The ratios of changes in water content of the soil during drying and rewetting over a given pressure head range were used to determine the importance of pore interactions and to separate the two types of pore blockage. Primary scanning curve data for porous materials ranging from glass beads to clay loam soil showed that pore blockage against air-entry during drying of a soil near saturation and pore blockage against water-entry during rewetting of a relatively dry soil were the two major types of pore interactions. The degree of pore blockage appeared to be dependent only on the water content of the soil. (Knapp-USGS)
W71-07277

MEASUREMENT OF ATTENUATION OF Cs-137 AND Am-241 GAMMA RAYS FOR SOIL DENSITY AND WATER CONTENT DETERMINATIONS,
Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.
J. C. Corey, S. F. Peterson, and M. A. Wakat.
Soil Science Society of America Proceedings, Vol 35, No 2, p 215-219, Mar-Apr 1971. 5 p, 4 fig, 3 tab, 9 ref.

Descriptors: *Nuclear moisture meters, *Gamma rays, *Expensive soils, Soil water movement, Soil density, Soil moisture meters, Instrumentation, Calibrations.
Identifiers: *Nuclear soil density meters.

A 400-channel pulse-height analyzer was shown to be adequate for determining the attenuation of a collimated gamma beam from a combined Am-241 and Cs-137 source. The method can be used to calculate the water content and soil density of either swelling or nonswelling soils. Soil density and water content can be determined concurrently by measuring the attenuation of two different gamma energies. With the multichannel pulse-height analyzer, it was simpler to adjust the area under the americium peak for the Compton contribution from the cesium radiation than with a single channel pulse-height analyzer. (Knapp-USGS)
W71-07278

THE DIFFUSION AND CONSUMPTION OF OXYGEN IN SUBMERGED SOILS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
R. H. Howeler, and D. R. Bouldin.
Soil Science Society of America Proceedings, Vol 35, No 2, p 202-208, Mar-Apr 1971. 7 p, 5 fig, 6 tab, 14 ref.

Descriptors: *Oxygen demand, *Aquatic soils, *Bottom sediments, Oxidation, Iron, Chemical oxygen demand, Oxygen, Aeration, Dissolved oxygen, Soil gases.
Identifiers: Submerged soils.

Six oxygen diffusion models were evaluated by measuring consumption rates under conditions which approached the steady state and under transient-state conditions. Consumption rates under approximately steady-state conditions were determined by placing undisturbed lake-bottom cores in water and measuring the decrease in oxygen concentration of the water. Transient-state consumption rates were determined from the amount of oxygen gas that had to be injected above an initially reduced soil to maintain a constant concentration at the soil surface. The distribution of extractable Fe in the cores was obtained by sectioning frozen soil cores and extracting the sections with NaOAc at pH 2.8 and with dithionite in EDTA. Considerable amounts of Fe (..2) WERE FOUND TO DIFFUSE FROM THE REDUCED ZONE TO THE OXIDIZED ZONE WHERE IT ACCUMULATED AS PRECIPITATED Fe (..3). The oxygen consumption was best described by models which included consumption by microbial respiration in the aerobic zone and oxidation of mobile and nonmobile reductants such as Fe (..2). (Knapp-USGS)
W71-07280

T1-208 AND Na-24 GAMMA SOURCES FOR IDENTIFYING SOIL WATER TAGGED WITH DEUTERIUM,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
R. H. Hawkins, R. F. Overman, and J. C. Corey.
Soil Science Society of America Proceedings, Vol 25, No 2, p 199-201, Mar-Apr 1971. 3 p, 2 fig, 8 ref. USAEC Contract AT (07-2)-1.

Descriptors: *Tracers, *Radioisotopes, *Soil water movement, Deuterium, Tracking techniques, Stable isotopes.
Identifiers: *Soil water tracers.

In situ tracing of soil water movement with the D2O Na-24 method is limited by the need to reactivate the Na-24 gamma source frequently (half-life of 15 hours) in a nuclear reactor. T1-208 produced the same neutron count rates from vials of D2O in dry and moist soils as did Na-24. The 1.9-year effective half-life of T1-208 in equilibrium with its parent nuclide Th-228 is a significant advantage over Na-24. Recent commercial availability of T1-208 sources now makes in situ D2O tracing of soil water feasible for investigators not having access to a nuclear reactor. (Knapp-USGS)
W71-07281

ECONOMIC IRRIGABILITY OF THE SOILS OF ROOSEVELT COUNTY, NEW MEXICO, 1967,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-07506

MICROBIAL DEGRADATION OF THE HERBICIDE ATRAZINE AND ITS 2-HYDROXY ANALOG IN SUBMERGED SOILS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
For primary bibliographic entry see Field 05B.
W71-07619

EFFECT OF SOIL MOISTURE HYSTERESIS ON THE WATER TABLE PROFILE AROUND A GRAVITY WELL,
Nevada Univ., Reno. Plant, Soil, and Water Science Div. and California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 02F.
W71-07626

ONE-DIMENSIONAL GRAVITY DRAINAGE OF UNIFORM COLUMNS OF POROUS MATERIALS,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
F. D. Whisler, and K. K. Watson.
Journal of Hydrology, Vol 6, No 3, p 277-296, 1968. 20 p, 14 fig, 12 ref.

Descriptors: *Soil water movement, *Infiltration, *Percolation, *Porous media, *Numerical analysis, Computer programs, Equations, Soils, Gravity, Hydraulic conductivity, Pressure head, Hydrology, Permeability, Recharge, Drainage, Withdrawal, Groundwater movement, Artificial recharge, Water spreading, Saturated flow, Water table.

A numerical analysis of the one-dimensional gravity drainage problem uses the pressure head form of the differential equation of flow. The analysis is programmed for solution by a digital computer and was tested against several sets of published experimental data with known hydrologic characteristics of porous material, and time profiles of pressure head and water content. The numerical approach was then used to investigate physical aspects of the drainage process. Problems involving intermittent inundation sequences were applied to deep sand profiles in groundwater recharge operations. The drainage of the saturated profile constitutes the first and simplest phase of an increasingly complex situation as the watering schedules develop. (Woodard-USGS)
W71-07629

MEASURING THE HYDRAULIC POTENTIAL OF GROUNDWATER WITH THE HYDRAULIC POTENTIAL PROBE,
Grontmij N.V., Bilt (Netherlands).
For primary bibliographic entry see Field 07B.
W71-07630

2H. Lakes

CHARACTERISTICS OF NEW YORK LAKES: PART 1A--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY COUNTIES,
Geological Survey, Albany, N.Y.
Phillip E. Greeson, and George E. Williams.
New York State Department of Environmental Conservation Bulletin 68A, 1970. 121 p, 1 fig, 1 tab.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Sites, Lake morphology, Hydrologic data, Surface waters, Surveys, Lake morphometry.
Identifiers: *New York lakes.

An alphabetical listing with physical descriptions of the lakes, ponds, and reservoirs of New York State was published as New York State Department of Environmental Conservation Bulletin 68. As an aid to water-resources managers, planners, and developers, the alphabetical entries are listed according to the 62 counties of New York State. Details and codes for the included parameters may be found in Bulletin 68. This supplemental Bulletin 68A accompanies supplemental Bulletin 68B, which presents an arrangement of the lakes, ponds, and reservoirs of New York State according to drainage basins. (See also W71-07186) (Woodard-USGS)
W71-07185

CHARACTERISTICS OF NEW YORK LAKES: PART 1B.-GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY DRAINAGE BASINS,
Geological Survey, Albany, N.Y.
Phillip E. Greeson, and George E. Williams.
New York State Department of Environmental Conservation Bulletin 68B, 1970. 122 p, 1 fig, 1 tab.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Sites, Lake morphology, Hydrologic data, Surface waters, Surveys, Lake morphometry.
Identifiers: *New York lakes.

An alphabetical listing with physical descriptions of the lakes, ponds, and reservoirs of New York State was published as New York State was published as New York State Department of Environmental Conservation Bulletin 68 by Greeson and Robison, 1970. As an aid to water-resources managers, planners, and developers, the alphabetical entries are listed according to the drainage basins of New York State. Details and codes for the included parameters may be found in Bulletin 68. This supplemental Bulletin 68B accompanies supplemental Bulletin 68A, which presents an arrangement of the lakes, ponds, and reservoirs of New York State according to counties. (See also W71-07185) (Woodard-USGS)
W71-07186

GAZETTEER OF LOUISIANA LAKES AND RESERVOIRS,
Geological Survey, Baton Rouge, La.
William J. Shampine.
Louisiana Department of Public Works Basic Records Report No 4, 1970. 31 p, 3 fig, 3 tab, 5 ref.

Descriptors: *Hydrologic data, *Lakes, *Reservoirs, *Louisiana, *Data collections, Surface waters, Lake morphology, Lake morphometry, Water resources development, Water utilization.
Identifiers: Basic-data compilation (Lakes).

There are more than 2,400 square miles of lake and reservoir surface area in Louisiana, which provide excellent opportunities for recreational, industrial, municipal, and agricultural usage. These lakes constitute a very significant part of the State's total water resources and are an integral part of the hydrology of many drainage basins. Physical data for all lakes and reservoirs having a surface area of 0.25 square mile or more are tabulated. Included are location, drainage area, elevation, surface area, volume, use, and outlet. Available basic data are listed. Lakes larger than 1 square mile are ranked in order of size. (Woodard-USGS)
W71-07247

A HYDROLOGIC MODEL OF THE LAKE ONTARIO LOCAL DRAINAGE BASIN,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
D. F. Witherspoon.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch, Technical Bulletin No 31, 1970. 12 p, 3 fig, 1 tab, 13 ref.

Descriptors: *Mathematical models, *Lake Ontario, *Hydrology, *Water balance, Precipitation (Atmospheric), Evaporation, Albedo, Temperature, Wind, Humidity, Runoff, Surface-groundwater relationships, Mathematical studies, Inflow, Discharge (Water), Evaluation, Routing.
Identifiers: Hydrologic models.

A mathematical model based on the water and energy balances is proposed for the Lake Ontario local drainage basin (27,100 square miles, comprising the entire local contributing area except for the lake's water surface area of 7,500 square miles). Using a hypothesis which provides estimates of the actual regional evaporation, regional moisture values are obtained which, when routed, simulate the measured monthly outflows from the land area. The model provides a means for studying the hydrology of the basin, simulation of long periods of record and basic relationships which can be used in developing forecasting techniques. Two analyses were performed to determine whether the model provided a good representation of the outflow from the local contributing area to the lake. In the first, the cumulative measured outflow was plotted on a time base with the cumulative computed outflow. Good agreement was achieved. The annual values of measured and computed outflow were plotted on the basis of a September through August water year. This water year was chosen with reference to the measured outflows which consistently showed that the lowest flows occur in August. As a result of a correlation of the annual values, the correlation coefficient was 0.92, with a standard error of 0.03. (Woodard-USGS)
W71-07250

DISTRIBUTION OF MERCURY IN UNCONSOLIDATED SEDIMENTS FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05B.
W71-07286

CHARACTERISTICS OF NEW YORK LAKES: PART 1 - GAZETTEER OF LAKES, PONDS, AND RESERVOIRS,
Geological Survey, Albany, N. Y.
Phillip E. Greeson, and F. Luman Robison.
New York State Department of Environmental Conservation Bulletin 68, 1970. 124 p, 2 fig, 1 plate, 5 tab, 3 ref.

Descriptors: *Lakes, *Ponds, *Reservoirs, *Documentation, *New York, Surface waters, Sites, Hydrologic data, Lake morphology, Surveys, Lake morphometry.
Identifiers: *New York lakes, Lake characteristics.

New York State has more than 4,000 lakes, ponds, and reservoirs. The gazetteer is an alphabetical listing of all lakes in the State having a surface area greater than 0.01 square mile and includes the following characteristics of each lake: name, county, number of counties in which the lake is located, quadrangle, number of quadrangles on which the lake is located, major and minor drainage basins, latitude, longitude surface elevation, drainage area, surface area, length of shoreline and volume. Over 800 unnamed ponds are included in the gazetteer. An alphabetical list is given of the topographic quadrangles coded to an index map showing location of the various topographic maps and the major surface water features. The lakes constitute a very significant part of the State's total water resources and are an integral part of the hydrology of the drainage basins. (See also W71-07185 and W71-07186) (Woodard-USGS).
W71-07297

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
Wun-Cheng Wang, and Ralph L. Evans.
Journal Water Pollution Control Federation, Vol 42, No 12, p 2117-2123, Dec 1970. 6 fig, 2 tab, 14 ref.

Descriptors: *Nitrates, *Phosphates, *Path of pollutants, *Surface runoff, Water temperature, Hydrogen ion concentration, Turbidity, Illinois, Dissolved oxygen, Alkalinity, Hardness (Water), Iron, Fluorides, Silica, Ammonia, Organic compounds, Nitrogen, Statistical methods, Flow rates.
Identifiers: *Peoria Lake (Illinois), Orthophosphates, Polyphosphates.

The dynamics of the concentration of certain minerals in a sector of the Illinois River were investigated. Use was made of the background concentration of fluoride in the stream as a reference source for defining the effect of stream flow on the mineral concentrations. Fluoride and orthophosphate-P concentrations decreased as stream flow increased. The ratio of orthophosphate-P to fluoride remained reasonably constant regardless of flow. The ratios of nitrate-N fluoride and organic-N fluoride increased as stream flow increased. The concentration-flow patterns strongly support the contention that a major source of nitrogen to the study area is derived from surface runoff whereas phosphorus from the same source is minimal. (Little-Battelle)
W71-07407

ANNUAL TEMPERATURE VARIATIONS IN AN IMPOUNDMENT IN CENTRAL ILLINOIS,
Illinois State Water Survey, Peoria.
V. Kothandaraman, and Ralph L. Evans.
Journal American Water Works Association, Vol 62, No 10, p 639-642, Oct 1970. 5 fig, 3 tab, 9 ref.

Descriptors: *Thermal stratification, *Computer models, *Temperature, Epilimnion, Lakes, Model studies, Impoundments.
Identifiers: *Lake Bloomington, *Temperature prediction model, Harmonic temperature gradient.

A harmonic equation is found to be an excellent representation of the annual temperature variations at all depths in a lake. A computer program is developed to evaluate the components of the harmonic using a continuous and equally spaced temperature record covering a period of at least one year. Summer stratification in the lake under study appears to persist from June to September. At sections of the lake with depths greater than 20 ft., all the three characteristic zones of summer stratification were observed. On the other hand, at sections with depths less than 20 ft., there was either no stratification, or the stratification consisted of a small but regular temperature gradient of about 5 to 15F from top to bottom. It would appear that the limiting depth of the epilimnitic zone in Lake Bloomington, as defined by temperature, is about 20 ft. (Oleszkiewicz-Vanderbilt)
W71-07443

DESTRATIFICATION EXPERIMENTS AT ROTTERDAM,
P. L. Knoppert, J. J. Rook, Tj. Hofker, and G. Oskam.
Journal American Water Works Association, Vol 62, No 7, p 448-454, July 1970. 11 fig, 2 tab, 13 ref.

Descriptors: *Thermal stratification, *Temperature, *Aeration, *Water quality, Thermocline, Mixing, Algae, Lakes.
Identifiers: *Artificial destratification, *Lake Maarsseveen, Zeeuws-Vlaanderen Reservoirs.

The experiments of Lake Maarsseveen showed that using compressed air as a method of artificial destratification permits the maintenance of a sharp thermocline at a chosen level. Also, these experiments showed that during artificial destratification, the thermocline sank to the same level over the entire lake, at any given time. Comparison of two techniques, for injecting air, an air bubble screen across the lake, and a single diffusor at one point, showed that the air bubble screen gave better results. From the Zeeuws-Vlaanderen experiment the tentative conclusion may be drawn that the depth of the lake in relation to optical characteristics of the water is an important parameter for the algal behavior of an impoundment, if the thermal conditions are modified artificially. (Oleszkiewicz-Vanderbilt)
W71-07447

THE EFFECTS OF URBAN DRAINAGE ON LAKE McILWAINE, RHODESIA,
For primary bibliographic entry see Field 05C.
W71-07524

PROCEEDINGS, GREAT LAKES WATER RESOURCES CONFERENCE.
For primary bibliographic entry see Field 06B.

W71-07565

HISTORY OF THE DEVELOPMENT OF USE OF THE GREAT LAKES AND PRESENT PROBLEMS,
Army Engineer Div., Chicago, Ill.
For primary bibliographic entry see Field 06B.
W71-07567

WATER CONFLICTS ON LAKE ERIE,
Pennsylvania Dept. of Health, Harrisburg, Pa.
For primary bibliographic entry see Field 05C.
W71-07569

CONFLICTS ARISING FROM THE USE OF SHORE PROPERTY ON THE GREAT LAKES,
Department of Public Works, Toronto (Ontario).
For primary bibliographic entry see Field 04C.
W71-07571

REGULATION OF GREAT LAKES LEVELS AND FLOWS,
United States Lake Survey, Detroit, Mich.
B. G. DeCooke.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 249-275, 1968.

Descriptors: *Cost-benefit analysis, *Lakes, *Statistics, *Economic evaluation, *Great Lakes, *Water supply, Precipitation, Runoff, Groundwater, Evaporation, Canals, Navigation, Time, Flooding, Erosion.
Identifiers: *Lake regulation, *Rule-and-limitation, *Stochastic approach, Regulation plans, Shore property.

A survey is made of the physical characteristics, hydraulics, and hydrology of the Great Lakes system, touching on such items as average lake levels, outflows, runoff, precipitation and evaporation. Both the rule and limitation approach and the stochastic approach to regulation plan development of water supplies are presented and compared. Specific plan examples are given for Lakes Superior and Ontario. The difficulties in regulation are discussed, including the natural hydrologic factors of precipitation, runoff, groundwater, and evaporation and the time lag difficulty in water supply. The interests of shore property, navigation, and power in the levels and outflows of the Great Lakes are also compared in terms of cost-benefit analysis to provide the economic justification for plan regulation. The basic objective of such regulation is the achievement of a regimen of lake levels and outflows giving consideration to both the beneficial and adverse effects on all the interests involved. (See also W71-07565) (Murphy-Rutgers)
W71-07572

STUDIES AND RESEARCH NEEDED IN REGULATION OF THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Department of Energy, Mines and Resources, Ottawa (Ontario).
A. M. Beeton, and H. B. Rosenberg.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 311-342, 1968.

Descriptors: *Great Lakes, *Water supply, *Water resource development, *Water quality, Reservoir, Dams, Water levels, Recreation, Environment, Population, Waste disposal, Navigation, Optimization.
Identifiers: *Multi-disciplinary activity, Shore property.

The need is indicated for multi-disciplinary study and research to solve Great Lakes problems due to increasing population pressures and increasing demands on the resource from various interests. Some suggested areas for this approach are engineering, economics, biology, sociology, and law. These are justified by the close relationship between water problems and socioeconomic problems as seen in the areas of shore property, hydro-power, recreation, water supply, navigation, waste disposal, and water diversions. Future studies should encompass hydrologic trends from environmental changes to optimize water resource development. Research is needed to determine the effect of changes in water levels on plant, animal and human life. This would provide a means for realizing benefits from engineering works on the lakes that will serve to enhance water quality, recreational use, and fish and wildlife habitat. (See also W71-07565) (Murphy-Rutgers)
W71-07573

NEW REQUIREMENTS IN WATER RESOURCES PLANNING ON THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
For primary bibliographic entry see Field 06B.
W71-07574

WATER QUALITY CONTROL PRACTICES ON THE GREAT LAKES,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 05G.
W71-07575

FLOATING VEGETATION OF LAKE KAINJI, NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
For primary bibliographic entry see Field 04A.
W71-07602

BOSMINA STRATIGRAPHY OF LAKE SEDIMENTS (FINNISH: JARVIKERROSTUMIEN BOSMINA-STRATIGRAFIASTA),
Pentti Alhonen.
Geologi (Finland), Vol 23, No 2, p 26-31, 1971. 6 p, 5 fig, 19 ref.

Descriptors: *Waterfleas, *Lakes, *Lake soils, *Sediment-water interfaces, Lake morphometry, Lake stages, Sediments, Plankton, Stratigraphy, Organic matter, Dystrophy, Crustaceans, Paleolimnology.
Identifiers: *Finland, *Lake sediments, Biostratigraphy, Ignition loss, Carbon-nitrogen ratio.

The stratigraphic distribution of Bosmina, a prevalent waterflea species of subfossil fauna of lake sediments, is examined for four northern Finnish lakes -- the Telkko, Sarkijarvi, Jarvenkylanjarvi and the Leppasjarvi. The four lakes of similar age are compared on the basis of Bosmina remains, calculated for one cubic centimeter of fresh sediment, ignition loss and the carbon/nitrogen ratio. Studies show that there is a marked increase in Bosmina production in the early stages of lake development but that a decrease in the stratigraphic fluctuation of the maxima is observed at later periods. It is suggested that Bosmina production is determined to a significant extent by morphometric and bathymetric changes in the lakes, since nutrient conditions along do not account for the Bosmina curve. Bosmina production may further be enhanced by the dystrophic process of lakes, as indicated by recent investigations in southwest Finland. (Josefson-USGS)
W71-07620

HYDROLOGIC SETTING OF DEER POINT LAKE NEAR PANAMA CITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W71-07639

USE OF THE 'PROMIN' COMPUTER FOR CALCULATING THE EFFECT OF A RIVER BASIN RESERVOIR ON MAXIMUM WATER DISCHARGES (RUSSIAN: OPYT PRIMENENIYA EVM 'PROMIN DLYA RASCHETA VLIYANIYA VODOKHRANILISHCHA V BASSEYNE REKI NA MAKSIMAL 'NYYE RASKHODY VODY),
For primary bibliographic entry see Field 02E.
W71-07648

PREDICTION OF VERTICAL PROFILES OF WIND SPEED OVER A LAKE,
Department of Energy, Mines and Resources, Burlington (Ontario). Centre for Inland Waters.
H. S. Weiler.
Proceedings of the Twelfth Conference on Great Lakes Research, Michigan University, Ann Arbor, Michigan, p 492-503, May 5-7, 1969. 4 fig, 3 tab, 27 ref.

Descriptors: *Winds, *Wind velocity, Air temperature, Height, Water temperature, *Lakes, Forecasting, *Lake Ontario, Great Lakes.
Identifiers: Vertical wind profile, Monin-Obukhov wind profile.

A large number of vertical profiles of mean wind speed above the lake surface were collected at a site in Lake Ontario in 1967. Two schemes for predicting the vertical profile of mean wind speed over a lake from measured values of air temperature and wind speed at one height, as well as the surface water temperature, were tried. A total of 787 wind speed profiles were analyzed, and showed that there was no significant difference in the ability of either the engineering formula approach used by meteorologists over land, or the modified Monin-Obukhov log plus linear wind profile approach, to predict the vertical profile within a standard deviation of 3.6 percent at the worst. It is concluded that for general computational purposes, the simpler of the two schemes, the engineering formula approach, would be preferable. (Upadhyaya-Vanderbilt)
W71-07666

EXISTING AND POTENTIAL PROBLEMS OF EXCESSIVE EUTROPHICATION IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Chattanooga. Water Quality Branch.
For primary bibliographic entry see Field 05C.
W71-07698

2I. Water in Plants

GROWTH AND PERFORMANCE OF COTTON IN A DESERT ENVIRONMENT: I. MORPHOLOGICAL DEVELOPMENT OF THE CROP; II. DRY MATTER PRODUCTION; III. CROP PERFORMANCE,
Cotton Research Corp., Namulonge (Uganda). Cotton Research Station.
For primary bibliographic entry see Field 03F.
W71-07154

THE PRODUCTIVITY OF ZONAL TERRESTRIAL PLANT COMMUNITIES AND THE MOISTURE AND HEAT PARAMETERS OF AN AREA,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 02D.
W71-07155

EFFECT OF ENVIRONMENTAL FACTORS ON CUTICULAR TRANSPIRATION RESISTANCE,
National and Univ. Inst. of Agriculture, Rehovoth (Israel). Volcani Inst. of Agricultural Research.
For primary bibliographic entry see Field 02D.
W71-07156

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 02G.

W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.
For primary bibliographic entry see Field 03F.
W71-07158

WATER STRESS AND APICAL DOMINANCE IN PISUM SATIVUM,
Regina Research Station (Saskatchewan).
G. I. McIntyre.
Nature New Biology, Vol 230, No 11, p 87-88, Mar 17, 1971. 2 p, 1 fig, 3 tab, 7 ref.

Descriptors: *Soil water-plant relationships, *Beans, *Transpiration, Testing, Test procedures, Plants, Plant growth, Plant physiology, Nitrogen, Carbohydrates.
Identifiers: *Water stress, *Apical dominance, Pisum sativum.

A recent study of apical dominance in isolated rhizomes of Agropyron repens L. Beauv. suggested that inhibition of the lateral buds by the rhizome apex largely depends on the supply of water, nitrogen and carbohydrate, any of which could act as a limiting factor and thus determine the degree of inhibition. To test this hypothesis, experiments were conducted with peas (Pisum sativum, variety 'Alaska'), which exhibit strong apical dominance and which are widely used in the study of this phenomenon. The results agreed with the concept of limiting nutritional factors, and suggest that for this species water stress may be particularly significant. (Woodard-USGS)
W71-07283

2J. Erosion and Sedimentation

EROSION RATES IN THE STEVEVILLE BADLANDS, ALBERTA,
Alberta Univ., Edmonton.
Ian A. Campbell.
Canadian Geographer, Vol 14, No 3, p 202-216, 1970. 7 fig, 7 tab, 26 ref.

Descriptors: *Soil erosion, *Sediment yield, *Precipitation (Atmospheric), *Geomorphology, Runoff, On-site data collections, Geology, Landforms, Semiarid climates, Seasonal, Particle size, Microenvironment, Slopes, Regression analysis, Correlation analysis.
Identifiers: *Alberta (Canada).

Geomorphological investigations of badlands have a number of advantages: (1) The areas are nearly totally devoid of vegetation and therefore lacking an unconsolidated but impermeable parent material which normally facilitates the quick development of erosional and depositional forms under rapid runoff conditions (2) The number of landform generating variables is minimal (3) since many formation or destruction processes are small scale, they may be observed and measured in detail. Nine 1 square yard runoff plots, encompassing a variety of microenvironmental conditions, were randomly selected in a number of relatively undisturbed rilled slopes. Each plot was supplied with a 6-inch rain gauge and 6 sediment yield collections were taken from July - October. Sample yields were weighed and wet-sieved for particle size determination. Weights were tabulated against precipitation amounts causing their production and particle size distributions were compared to lithological distributions. No relationship was found between the 2 sets of particle size distribution. There was an overall relationship between rainfall amount and sediment yield but linear regression analysis for each rainfall period showed no correlation between these amounts for any period. It was therefore necessary to individually analyze each plot's rainfall and sediment yields, and a strong correlation was then found. Annual sediment yield rates are likely to be underestimated because of drainage due to snowmelt. Moreover, downslope sediment yield occurs piecemeal. Results should be interpreted cautiously. (Casey-Arizona)
W71-07165

FATTY ACID DIAGENESIS IN RECENT SEDIMENT FROM NARRAGANSETT BAY, RHODE ISLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
John W. Farrington, and James G. Quinn.
Nature Physical Science, Vol 230, No 11, p 67-69, Mar 15, 1971. 3 p, 1 fig, 2 tab, 8 ref.

Descriptors: *Sedimentology, *Sediments, *Diagenesis, *Bays, *Organic acids, Core drilling, Sampling, Analytical techniques, Rhode Island, Texas.
Identifiers: *Narragansett Bay (RI), *Baffin Bay (Tex).

The total fatty acid concentrations in cores from recent sediments from Narragansett Bay, Rhode Island decreased rapidly from 0 to 8 cm to 16 to 33 cm and level off at 33 to 52 cm. This may be due to a diminution of bacterial and/or infaunal activity at the last of these depths of burial. The concentration of the unsaturated fatty acids relative to the saturated fatty acids decreases rapidly with depth. This can be attributed to any one or a combination of the following: (1) the greater stability of the saturated fatty acids relative to the unsaturated fatty acids; (2) the conversion of some of the unsaturated fatty acids to their saturated analogues; (3) preferential resynthesis of saturated fatty acids because of bacterial or infaunal activity. The fatty acid concentrations from samples collected at Narragansett Bay are compared with findings from a similar study made in Baffin Bay, Texas. (Woodard-USGS)
W71-07261

MARINE SHELL RADIOCARBON DATES AND THE CHRONOLOGY OF DEGLACIATION IN WESTERN SCOTLAND,
Institute of Geological Sciences, Edinburgh (Scotland).
J. D. Peacock.
Nature Physical Science, Vol 230, No 2, p 43-45, Mar 8, 1971. 3 p, 1 fig, 3 tab, 14 ref.

Descriptors: *Radioactive dating, *Clays, *Marine geology, *Carbon radioisotopes, *Sedimentation, Glaciation, Bentonite, Core drilling, Boreholes, Bottom sediments, Sampling, Pleistocene epoch.
Identifiers: *Scotland.

Richly fossiliferous marine clays of late-Glacial age have long been known from the Clyde area and from isolated localities as far north as Fort William, and radiocarbon dates have been published from such clays incorporated in terminal moraines of the Loch Lomond readvance. Dates for four additional localities determined at Stockholm on behalf of the Institute of Geological Sciences are presented. At South Shian at the seaward end of Loch Creran, the shells were obtained from glacially disturbed marine clay exposed below morainic sands near the ferry pier. The dates, which fall within the Allerod part of the Late Weichselian, compare with those from Drymen and Menteith and confirm that the glacial deposits belong to the Loch Lomond readvance. (Woodard-USGS)
W71-07262

INITIAL REPORTS OF THE DEEP SEA DRILLING PROJECT, VOL. 6--HONOLULU, HAWAII TO APRA, GUAM, JUNE-AUGUST, 1969.
Scripps Institution of Oceanography, La Jolla, Calif.

For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). National Science Foundation Publication, Feb 1971: Washington, DC, US Government Printing Office. 1,329 p. NSF Contract C-482.

Descriptors: *Oceanography, *Core drilling, *Pacific Ocean, *Sediments, *Marine geology, Data collections, Sampling, Stratigraphy, Stratification, Sediment transport, Deposition (Sediments), Provenance, Petrography, Chemical properties, Physical properties, Water chemistry.
Identifiers: *Philippine Sea.

Four of the major oceanographic institutions that have strong interests in the fields of marine geology and geophysics formed the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) in May 1964. This group included Lamont-Doherty Geological Observatory; the Institute of Marine Sciences, University of Miami; THE Scripps Institution of Oceanography, University of California at San Diego; and the Woods Hole Oceanographic Institution. The membership of this original group was later enlarged in 1968 when the University of Washington became a member. The goal of the Deep Sea Drilling Project is to gather scientific information that will help determine the age and processes of development of the ocean basins. Cores recovered from deep beneath the ocean floor provide reference material for a multitude of future studies in fields such as biostratigraphy, physical stratigraphy, and paleomagnetism, that will afford a new scope for studies of the physical and chemical aspects of sediment provenance, transportation, deposition, and diagenesis. This volume contains data collected during a cruise from Honolulu, Hawaii, to Apra, Guam, June-August, 1969. (See also W71-07288 thru W71-07291) (Woodard-USGS)
W71-07287

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 6,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
F. T. Manheim, and F. L. Sayles.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 811-821, February 1971: Washington, DC, US Government Printing Office. 11 p, 2 tab, 1 ref. NSF Contract C-482.

Descriptors: *Connate water, *Core drilling, *Sediments, *Water chemistry, *Pacific Ocean, Interstices, Marine geology, Porosity, Sampling, Water quality, Chemical analysis, Data collections, Analytical techniques, Water storage, Diagenesis.
Identifiers: *Interstitial water, Sediment waters, Philippine Sea.

Sediments from sites west of the Hawaiian Islands consisted primarily of variouscombinations of deep-sea biogenic oozes, volcanic ash, and its breakdown products. Pore fluids from most of the sites were similar in composition to present day ocean water, and in some sites almost identical. However, interstitial fluids from Site 53 (Philippine Sea) showed changes in ionic composition which were beyond those previously considered attributable to diagenetic influence. These samples show the beginnings of metamorphism by dramatic increases in calcium concentrations and corresponding decreases in alkali concentrations. Increases in calcium concentration to over 3000 ppm were encountered in Site 53; these contrast sharply with values of about 400 ppm for oceanic waters and common pore fluid values. The concentrations of major and minor constituents are tabulated. (See also W71-07287) (Woodard-USGS)
W71-07288

INTERSTITIAL WATER CHEMISTRY: DEEP SEA DRILLING PROJECT, LEG 6,
California Univ., Los Angeles. Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
B. J. Presley, and I. R. Kaplan.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 823-828, Feb 1971: Washington, DC, US Government Printing Office. 6 p, 2 tab, 4 ref. NSF Contract C-482.

Descriptors: *Core drilling, *Connate water, *Sediments, *Pacific Ocean, *Water chemistry, Interstices, Marine geology, Sampling, Water quality, Chemical analysis, Analytical techniques, Data collections, Porosity, Water storage.
Identifiers: *Interstitial water, Sediment waters, Philippine Sea.

The interstitial water from cores taken between Hawaii and Guam consist of 49 samples of approximately 5 milliliters each, 4 samples of approximately 100 milliliters each, and 4 samples of approximately 10 mililiters each. These pore waters were squeezed from sediment consisting primarily of biogenic oozes and volcanic ash, and were collected at 14 sites in the NW Pacific Ocean and Philippine Seas. Analysis was started as soon as the samples had arrived at UCLA, nevertheless, as much as 3 months had then elapsed after collection. The iron, cobalt and copper concentrations show less variation than values obtained previously. This could be due to the more uniform lithology of the Leg 6 sediments. Biogenic oozes yield pore waters somewhat enriched in these trace metals, when compared to terrigenous-derived sediments. Chemical analyses data re tabulated. (See also W71-07287) (Woodard-USGS)
W71-07289

GRAIN SIZE RESULTS AND COMPOSITION OF THE SAND FRACTION, LEG 6,
Scripps Institution of Oceanography, La Jolla, Calif.
A. C. Pimm.
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402-Price-$15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 709-737, Feb 1971: Washington, DC, US Government Printing Office. 29 p, 2 fig, 3 plate, 2 tab. NSF Contract C-482.

Descriptors: *Sedimentology, *Pacific Ocean, *Core drilling, *Sediments, *Particle size, Marine geology, Physical properties, Sampling, Methodology, Data collections, Sediment transport, Deposition (Sediments), Sands.
Identifiers: *Sand fraction.

The complete grain size results from analyses of sediment core samples from the Northwest Pacific Ocean are tabulated. The sand fraction recovered from the grain size analysis was examined under a binocular microscope. A complete summary of the composition of the sand fraction is given. In brief, the sand fraction of chalk oozes is dominated by planktonic foraminifera. Siliceous microfossils are rare in the chalk oozes and are usually only present in Upper Oligocene and younger sediment being most common in the Caroline Ridge sites. Detrital and authigenic minerals are extremely rare and probably make up less than 1% of the total sand fraction. (See also W71-07287) (Woodard-USGS)
W71-07290

SEDIMENTOLOGY SYNTHESIS: LITHOLOGY, CHEMISTRY AND PHYSICAL PROPERTIES OF SEDIMENTS IN THE NORTHWESTERN PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.; and California Univ., Santa Cruz.
A. C. Pimm, R. E. Garrison, and R. E. Boyce
For sale by Superintendent of Documents, US Government Printing Office, Wash, DC 20402 - Price - $15.50 (casebound). In: Initial Reports of the Deep Sea Drilling Project, Vol 6, National Science Foundation Publication, p 1131-1252, Feb 1971, Washington, DC, US Government Printing Office. 121 p, 15 fig, 38 plate, 8 tab, 24 ref. NSF Contract C-482.

Descriptors: *Sedimentology, *Pacific Ocean, *Core drilling, *Sediments, Petrography, Chemical properties, Physical properties, Marine geology, Mineralogy, Sampling, Data collections, Instrumentation, Methodology, Sediment transport, Deposition (Sediments).
Identifiers: *Philippine Sea.

Brown clay was recovered from core sediment samples at 8 sampling sites in the Northwest Pacific Ocean. Of these sites, 4 were in water depths exceeding 5000 meters with brown clay ranging in age from Recent to Upper Cretaceous. Two of these sites contain carbonates in the Middle to Lower Cretaceous. Two sites were in water depths ranging from 4300 to 4600 meters and only contain brown clay in the Upper Tertiary. One site has some interbedded marl ooze with the brown clay in the Pleistocene; the water depth there was 4282 meters and, therefore, is probably close to the calcium carbonate compensation depth. The distribution of the brown clay is closely related to water depth and on the evidence of drilling during Leg 6, occurs everywhere in the West Pacific in water deeper than about 4000 to 4200 meters and in the Philippine Sea in water deeper than 4500 meters. (See also W71-07287) (Woodard-USGS)
W71-07291

SILVER-108m IN BIOTA AND SEDIMENTS AT BIKINI AND ENIWETOK ATOLLS,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 05B.
W71-07600

HOLOCENE SEDIMENTATION RATES IN OVERBANK DEPOSITS IN THE BLACK BOTTOM OF THE LOWER OHIO RIVER, SOUTHERN ILLINOIS,
Illinois Univ., Urbana. Dept. of Geography.
Charles S. Alexander, and Jean Cutler Prior.
American Journal of Science, Vol 270, No 5, p 361-372, May 1971. 12 p, 6 fig, 2 tab, 14 ref.

Descriptors: *Sedimentation, *Ohio River, *Sedimentation rates, *Radioactive dating, Sedimentary structures, Deposition (Sediments), Sediment distribution, Sediment load, Sediment yield, Carbon radioisotopes, Flood plains, Alluvium, Alluvial channels.
Identifiers: *Natural levees.

Radiocarbon dates of organic matter collected from the alluvium of the Black Bottom portion of the Ohio River flood plain indicate three rates of sedimentation in the recent past, in natural levee, swale, and ridge deposition. All rates reflect the varied environments of deposition on the flood plain and can be ordered with regard to increasing intensity as follows: ridge deposition, swale fill, and natural levee deposition. The persistence of deposition on the ridges and swales despite the more rapid levee growth requires some periodic restraint upon levee sedimentation--probably by episodes of river bank erosion. Periods of river bank erosion interspersed with river bank deposition could account for the long term dynamic stability in the river margin. The slowly increasing rate of deposition may be related to the gradual decline in the flow of excess Ohio River flood waters through the adjacent Cache Valley beginning about 8000 years ago and to vegetation disturbance by upriver cultivation during the last 1500 years. (Knapp-USGS)
W71-07606

OREGON AND NORTHERN CALIFORNIA COASTAL RECONNAISSANCE,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
Richard J. Russell.
Louisiana State University Coastal Studies Institute Technical Report 86, Aug 30, 1970. 25 p, 1 map, 18 photo, 16 ref. ONR Contract N00014-69-A-0211-0003, Project NR388002.

Descriptors: *Beach erosion, *Coasts, *Marine geology, *Oregon, *California, Subsurface flow, Zone of aeration, Hydrogeology, Zone of saturation, Groundwater movement, Water table, Water level fluctuations, Bedrock, Shoals, Reefs, Shores, Oceans, Recreation, Boats, Geomorphology, Erosion.
Identifiers: *Coastal landforms, Sea cliffs, Beach rock.

Erosion of sea cliffs above and below the water table in Oregon and northern California was studied during a reconnaissance in April and May 1970. Retreat of sea cliffs in the zone of aeration above groundwater level is associated with the development of platforms of marine abrasion toward the top of the underlying zone of cementation, where rock is more durable. Pseudo-beach rock in sandy beaches consists of bedrock abraded along the zone of water table fluctuation. Some general comments on coastal landforms are included and some applications are indicated for users of small boats. (Woodard-USGS)
W71-07610

SEDIMENT PATTERNS, PHYSICAL CHARACTERS OF THE WATER MASS AND FORAMINIFERIDA DISTRIBUTION IN INDIAN RIVER, BAY, COASTAL DELAWARE,
Delaware Univ., Newark. Dept. of Geology; and Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 02L.
W71-07612

BED LOAD TRANSPORTATION IN ALLUVIAL CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
Satya P. Garg, A. K. Agrawal, and Prem Raj Singh.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY 5, Paper 8091, p 653-664, May 1971. 12 p, 4 fig, 1 tab, 18 ref, append.

Descriptors: *Bed load, *Sediment transport, *Alluvial channels, Hydraulic models, Flumes, Equations, Hydraulics, Tractive forces, Sedimentation.
Identifiers: Flume models.

A new approach for calculation of bed load considers the total energy balance of flows in mobile-bed channels. The proposed equation utilizes the known hydraulic parameters and sediment characteristics along with the Shields' critical tractive force curve. Experiments were conducted in a 158-ft long and 4-ft wide flume having glass sides. The mean grain sizes for the experimental sand, as calculated by Simpson's formula, were 0.289 mm, 0.49 mm, and 0.534 mm. The sediment transport calculated from the proposed equation was compared with the measured value. The correspondence of the observed and computed bed load transport is quite satisfactory for the plotted data. (Knapp-USGS)
W71-07613

NOTE ON REMOVAL OF SULFUR INTERFERENCES FROM SEDIMENT EXTRACTS FOR PESTICIDE ANALYSIS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 05A.
W71-07621

CLASSIFICATION AND REGIONALIZATION OF TORRENTIAL MUDFLOWS IN THE UKRAINIAN CARPATHIANS (KLASSIFIKATSIYA SELEY I RAYONIROVANIYE BASSEYNOV SELEOPASNYKH REK UKRAINSKIKH KARPAT),
For primary bibliographic entry see Field 02E.
W71-07657

LANDSLIDING IN THE VICINITY OF THE VAN NORMAN LAKES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07660

2K. Chemical Processes

IDENTIFICATION OF PETROLEUM PRODUCTS IN WATER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 05A.
W71-07240

ION PAIRING IN 2:2 COMPLEX ION ELECTROLYTES: (Co (NH3)5NO2)SO4,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 01B.
W71-07248

PREDICTION OF SATURATION PRECIPITATION OF LOW SOLUBILITY INORGANIC SALTS FROM SUBSURFACE WATERS UNDER CONDITIONS OF TOTAL CONCENTRATION, TEMPERATURE AND PRESSURE,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
R. O. Van Everdingen.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch, Technical Bulletin No 30, 1970. 13 p, 5 fig, 3 tab, 10 ref, append.

Descriptors: *Saturation, *Chemical precipitation, *Subsurface waters, *Solubility, Temperature, Pressure, Salts, Aqueous solutions, Chemical analysis, Hydrologic data, Evaporation, Ionization, Mathematical studies, Water chemistry.
Identifiers: *Solubility graphs.

Graphs are presented that enable the determination of the degree of saturation of aqueous solutions with respect to BaSO4, CaSO4, SrSO4, BaF2, CaF2 and MgF2 under a variety of conditions of temperature, pressure and total-salt concentration. Also presented are examples of the influence of temperature changes, dilution, evaporation, addition of non-common salt, and mixing, on the degree of saturation. (Woodard-USGS)
W71-07249

SOURCES OF NITROGEN IN WATER SUPPLIES,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05B.
W71-07255

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W71-07256

FATTY ACID DIAGENESIS IN RECENT SEDIMENT FROM NARRAGANSETT BAY, RHODE ISLAND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 02J.
W71-07261

ANOMALOUS WATER, POROUS GLASS AND SILICIC ACID,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
For primary bibliographic entry see Field 01A.
W71-07263

WATER DYNAMICS IN CLAYS BY NEUTRON SPECTROSCOPY,
Sydney Univ. (Australia). Dept. of Physical Chemistry.
For primary bibliographic entry see Field 02G.
W71-07264

PHYSICO-CHEMICAL PROPERTIES OF SOLS AND GELS OF Na-MONTMORILLONITE WITH AND WITHOUT ADSORBED HYDROUS ALUMINUM OXIDE,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-07275

THE DIFFUSION AND CONSUMPTION OF OXYGEN IN SUBMERGED SOILS,
Cornell Univ., Ithaca, N.Y. Dept. of Agronomy.
For primary bibliographic entry see Field 02G.
W71-07280

INTERSTITIAL WATER STUDIES ON SMALL CORE SAMPLES, DEEP SEA DRILLING PROJECT, LEG 6,
Geological Survey, Woods Hole, Mass.; and Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W71-07288

INTERSTITIAL WATER CHEMISTRY: DEEP SEA DRILLING PROJECT, LEG 6,
California Univ., Los Angeles. Dept. of Geology; and California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 02J.
W71-07289

SEDIMENTOLOGY SYNTHESIS: LITHOLOGY, CHEMISTRY AND PHYSICAL PROPERTIES OF SEDIMENTS IN THE NORTHWESTERN PACIFIC OCEAN,
Scripps Institution of Oceanography, La Jolla, Calif.; and California Univ., Santa Cruz.
For primary bibliographic entry see Field 02J.
W71-07291

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
Stephen J. Toth, and Arthur N. Ott.
Environmental Science and Technology, Vol 4, No 11 p 935-939, Nov 1970. 4 tab, 11 ref.

Descriptors: *Cation exchange, *Sediments, *Encroachment, *Water pollution, Soil analysis, Analytical techniques, Organic matter, Delaware River, Hudson River, Ponds, Freshwater, New Jersey, Pennsylvania, Saline water.
Identifiers: Sample preservation, Chesapeake Bay, Barnegat Bay.

Modifications were determined of soil characterization methods which would be required to characterize bottom sediments based upon samples taken from some rivers, bays, and freshwater impoundments. Two PARAMETERS WERE USED: cation exchange capacity (CEC) and exchangeable cation status (ECS). CEC is the ability of an exchanger, expressed in terms of me. per 100 g, to retain a specific cation at a certain pH value and salt concentration. ECS, expressed in like terms, refers to the amount of Na, K, Ca, Mg, and H held by the soil complex. It was determined that CEC and ECS values can be utilized in determining salt-water intrusions and pollution effects. These values need to be determined on fresh or frozen and thawed sediments since drying reduces CEC and exchangeable Fe and Mn contents. Exchangeable H ions cannot be determined in NH4OAc extracts because large amounts of dispersed organic matter and exchangeable Fe and Mn are present. There are extremely wide variations found in CEC and ECS values. The organic content of bottom sediments is responsible for about 80 percent of the CEC. (Mortland-Battelle)
W71-07390

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 02H.
W71-07407

DETERMINATION OF FLUORIDE POLLUTANTS IN NATURAL WATERS USING A KNOWN-ADDITION TECHNIQUE,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05A.
W71-07457

POLYWATER ON SILICA-FREE SUBSTRATES,
Commonwealth Scientific and Industrial Research Organization, Ryde (Australia). Div. of Food Preservation.
For primary bibliographic entry see Field 01B.
W71-07603

SIMULTANEOUS DETERMINATION OF ARSENATE AND PHOSPHATE IN NATURAL WATERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 05A.
W71-07617

POTENTIAL APPLICATION OF AN INFRARED SPECTRORADIOMETER FOR REMOTE DETECTION AND IDENTIFICATION OF OIL SLICKS ON WATER,
Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 05A.
W71-07618

DETERMINATION OF CALCIUM BY RADIOCHEMICAL REPLACEMENT,
Reading Univ. (England).
H. J. M. Bowen.
Analyst, Vol 96, No 1140, p 220-222, Mar 1971. 3 p, 2 fig, 1 tab, 11 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Calcium, *Radiochemical analysis, Analytical techniques, Instrumentation.
Identifiers: *Calcium determination, Radiochemical replacement, Oxalates, Silver-110, Manganese-54, Cobalt-60.

Calcium ions in solution may be determined by radiochemical replacement of silver-110 in labeled solid silver oxalate, cobalt-60 in labeled cobalt oxalate and manganese-54 in labeled manganese oxalate. A one-to-one replacement was observed with manganese oxalate. The technique can be used to determine 25 to 100 micromole per ml (100 to 4000 micrograms per ml) of calcium, and the lower limit is reduced to 16 micrograms per ml by using a 50 percent methanol solution. Magnesium interferes to only a small extent. Each determination takes less than 5 minutes, and the precision is 2 percent. (Woodard-USGS)
W71-07640

PROPYLENE CARBONATE EXTRACTION OF TRIS (PENTAN-2, 4-DIONE)-IRON (III) FROM AQUEOUS SOLUTION: APPLICATION TO THE

SPECTROPHOTOMETRIC DETERMINATION OF IRON,
Wofford Coll. Spartanburg, S.C. Dept. of Chemistry.
B. G. Stephens, James C. Loftin, William C. Looney, and Kenneth A. Williams.
Analyst, Vol 96, No 1140, p 230-234, Mar 1971. 5 p, 1 fig, 3 tab, 8 ref.

Descriptors: *Water chemistry, *Chemical analysis, *Iron, *Aqueous solutions, *Spectrophotometry, Carbonates, Analytical techniques, Instrumentation.
Identifiers: *Propylene carbonate, Reagents.

Orange tris (pentan-2, 4-dione) iron (III) was extracted from aqueous solution into propylene carbonate at pH 4.0 to 9.0. Distribution coefficients ranged from 23.9 to 116, depending on the ionic strength and pH of the aqueous phase. Relative standard deviations of the spectrophotometric methods developed are 1.52 percent or less and these methods are applicable to the routine determination of 56 to 391 micrograms of iron. (Woodard-USGS)
W71-07641

THIAMINE LIMITED STEADY STATE GROWTH OF THE YEAST CRYPTOCOCCUS ALBIDUS,
Alaska Univ., College. Inst. of Marine Science.
D. K. Button.
University of Alaska, College, Institute of Marine Science, Mimeo, (Undated). 20 p, 4 fig, 3 tab, 15 ref. OWRR Project A-007-ALAS (3).

Descriptors: *Vitamin B, *Growth rates, *Yeasts, Microogranisms, Mathematical models, Nutrients, Temperature, Hydrogen ion concentration, Energy, Population, Oxygen, Enzymes.
Identifiers: *Thiamine, *Cryptococcus albidus, Continuous culture, Batch growth, Stirring rate.

The concentration-growth rate relationship of a thiamine-requiring microorganism was examined. Cryptococcus albidus was selected on the basis of its thiamine requirement, marine origin, and amenability to continuous culture. Although oscillations in the organism population were generated under some nutritional conditions, such as manganese deficiency, the thiamine limited steady state was smooth and constant. Thiamine free glucose was prepared by irradiating the required amount of recrystallized glucose in a small quarts tube for one hour with an ultraviolet lamp. The half life of thiamine is in the order of minutes under these conditions. Data suggest a diffusion limited mechanism characterized by an apparent Michaelis constant for growth of 0.47 picomoles. This relationship was obtained from continuous culture at steady state and checked by a non-steady state procedure and in batch growth. These checks were compatible with the value reported. It was concluded that most natural water systems have sufficient thiamine to support some thiamine-requiring microorganisms at above rate limiting concentrations. Thus where thiamine is an important factor in the ecology of heterotrophic systems it is probably in a range below current means of analytical detection. (Jones-Wisconsin)
W71-07678

ORIGIN OF COLORS AND IRONSTONE BANDS IN THE COLUMBIA FORMATION, MIDDLETOWN-ODESSA AREA, DELWARE,
Delaware Geological Survey, Newark.
N. Spoljaric.
Southeastern Geology, Vol 12, No 4, p 253-266, Apr 1971. 14 p, 7 fig, 2 tab, 18 ref. OWRR Project B-002-DEL (3).

Descriptors: *Delware, *Water chemistry, *Iron, *Groundwater movement, Chemical precipitation, Water levels, Water table, Leaching, Water quality, Aquifers, Sands, Sandstones, Mineralogy, Geology, Geochemistry.
Identifiers: Columbia Formation (Del).

Colors in the Columbia Formation (Pleistocene) in the study area are dependent on the amount of iron present. The source of iron found in these sediments is the underlying greensand of the Rancocas Formation (Paleocene-Eocene age). Iron seems to have been transported from its source by groundwater and precipitated in the capillary fringe zone and zone of watertable fluctuations. Ironstone bands, however, are thought to have been formed in the zone by aeration by the precipitation of iron from groundwater. In general there is no relationship between the shape and size of the ironstone bands and the textures and structures of the sediments that contain them. The shapes of the bands reflect the type of the groundwater flow at the time of formation. (Knapp-USGS)
W71-07692

2L. Estuaries

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
For primary bibliographic entry see Field 05D.
W71-07092

EFFECTS OF POLYSTREAM AND DRILLEX ON OYSTER SETTING IN CHESAPEAKE BAY AND CHINCOTEAGUE BAY,
Bureau of Commercial Fisheries, Oxford, Md. Biological Lab.
For primary bibliographic entry see Field 05C.
W71-07146

TILLAMOOK BAY, OREGON.
Corps of Engineers, Washington, D.C. Committee on Tidal Hydraulics.

Printed by US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Jan 1970. 15 p, 2 pl.

Descriptors: *Jetties, *Channel improvement, Estuaries.
Identifiers: *Tillamook Bay (Ore), Jetty spacing.

Committee on Tidal Hydraulics was requested to review plans for construction of south jetty, approximately 7800 ft in length, at entrance to Tillamook Bay, primarily to provide protection for navigation against southwesterly storm waves but also to reduce maintenance requirements of channel. Proposed spacing between north and south jetties, if a deep-draft channel is authorized in the future, has been questioned. Pertinent information on tidal prism, littoral drift, ecological (oyster bed) considerations, discharge and current velocities, and south jetty plans are given in this report. Conclusions of Committee are presented along with recommendations which include a revised alignment for south jetty, a surveillance program, and a small-scale fixed-bed hydraulic model to study interrelation of jetty spacing and tidal prism. (Spivey-WES)
W71-07174

THE LAW PERTAINING TO ESTUARINE LANDS IN SOUTH CAROLINA,
For primary bibliographic entry see Field 06E.
W71-07208

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 05A.
W71-07256

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
Vincent J. Bellis.
Copies available from Water Resources Research Inst, 124 Riddick Bldg, North Carolina State Univ, Raleigh, NC, 27607, Price $2.50. North Carolina University Water Resources Research Institute Report No 46, Jan 1971. 28 p, 7 fig, 5 tab, 13 ref. OWRR Project A-044-NC (1) Agreement No 14-31-0001-3033, FY 1970.

Descriptors: *Esturaries, *Phytoplankton, *Distribution patterns, *North Carolina, *Computer programs, Data processing, Data collections, Variability, Probability, Water pollution effects, Algae, Aquatic habitats, Aquatic environment.
Identifiers: *Pamlico River (NC).

A computer based technique for analyzing distribution patterns among estuarine organisms was developed and tested on phytoplankton collections from Pamlico River, North Carolina. Jaccard's coefficient of similarity was used to generate a similarity matrix with final printout in dendrogram form showing clusters of collections having inherent similarity. Use of a similarity index based solely upon presence or absence of species within all possible pairs of data collections produced a dendrogram which described the seasonal periodicity of phytoplankton in the central Pamlico River. Computer programs developed in this project are written in Fortran IV and have been deposited in the program library of the East Carolina University Computer Center and can be obtained upon request from its director. (Knapp-USGS)
W71-07337

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 02K.
W71-07390

THERMAL INVESTIGATIONS IN CALIFORNIA,
Pacific Gas and Electric Co., Emeryville, Calif.
For primary bibliographic entry see Field 05C.
W71-07420

THE ESTUARINE VERSION OF THE COLHEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05B.
W71-07428

SEDIMENT PATTERNS, PHYSICAL CHARACTERS OF THE WATER MASS AND FORAMINIFERIDA DISTRIBUTION IN INDIAN RIVER, BAY, COASTAL DELAWARE,
Delaware Univ., Newark. Dept. of Geology; and Oregon State Univ., Corvallis. Dept. of Oceanography.
John C. Kraft, and Gertrude Margules.
Southeastern Geology, Vol 12, No 4, p 223-252, Apr 1971. 30 p, 17 fig, 21 ref, append. NSF Grant GP-5604.

Descriptors: *Bottom sediments, *Estuaries, *Benthos, *Distribution patterns, *Delaware, Benthic fauna, Aquatic microorganisms, Sedimentation, Water quality, Saline water intrusion, Water temperature, Salinity, Water chemistry.

Identifiers: Indian River Estuary (Del).

The physiographic setting, bottom sediment facies patterns, salinity, temperature, pH, Eh, and organic content of the water mass and bottom sediments of the Indian River Estuary, Delaware, were correlated with the distribution of living benthonic Foraminiferida. Twelve genera, including 23 species of Foraminiferida, were tentatively identified and separated into six geographically defined facies groups. No significant correlation was found between patterns of foraminiferal abundance and the distribution of sediment types. Furthermore, with the exception of an Ammobaculites assemblage occuring in the tidal streams to the west, there is no significant association between species occurrence and the physical parameters observed. The species of benthonic Foraminiferida found living in the Indian River estuary system appear to be tolerant of highly varied bottom sediment types and physical characteristics of the water mass. (Knapp-USGS)
W71-07612

A SURVEY OF THE PROBLEMS AND RESEARCH NEEDS IN THE COASTAL ZONE,
Old Dominion Univ. Research Foundation, Norfolk, Va.
William J. Hanna, Harold G. Marshall, and James F. Slowey.
Available from the National Technical Information Service as N70-40812, $3.00 in paper copy, $0.95 in microfiche. NASA Report CR-11780, Sept 15, 1970. 103 p, 66 ref. Contract No NAS 1-9434-13.

Descriptors: Research and development, Pollutants, Biology, Estuaries, *Fisheries, *Oceanography, *Chemical analysis, *Geologic investigations, *Air-water interfaces, *Meteorology, *Data collection, Sampling, Remote sensing.
Identifiers: Earth Resources Satellite.

An investigation to establish the major problems and research needs in the coastal zone was conducted. Biology, chemical and physical oceanography, geology and meteorology were the disciplines studied with emphasis on interdisciplinary requirements. Recommendations were made for more physical data on water circulation, current patterns and their temporal variations; temperature, salinity and mixing data; extensive in situ samplings; surface waves; sea and shore interaction and seabed conditions, all of which are basic to solving the major problem of pollution. Recommendations were also made for cooperation between NASA and NSF concerning ERTS application to the International Decade of Occanographic Exploration. (Ensign-PAI)
W71-07673

THIAMINE LIMITED STEADY STATE GROWTH OF THE YEAST CRYPTOCOCCUS ALBIDUS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 02K.
W71-07678

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SALINE WATER CONVERSION PROGRAM--APPROPRIATION.
For primary bibliographic entry see Field 06E.
W71-07491

ELECTRODIALYSIS FOR DESALTING HAWAIIAN BRACKISH GROUNDWATER: A FIELD STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. Stephen Lau, and James C. S. Chou.
Water Resources Research Center Technical Report No 41, University of Hawaii, Honolulu, July 1970. 20 p, 4 fig, 4 tab, 24 ref.

Descriptors: *Desalinization, Hawaii, *Electrodialysis, *Brackish water, Water treatment.
Identifiers: Brackish groundwater, Groundwater pollution.

A field study was made to evaluate the applicability and problems of desalting brackish groundwater from basaltic and reef limestone aquifers in Honolulu, Hawaii with the electrodialysis process. The three-week study indicated that the brackish water at both sites was upgraded to potable quality and the rejection of ionized salts was above 80 percent. No pretreatment was necessary. Both the average production and rejection rates were about 420 gpd. An economic evaluation was not determinable from the short-term results. (Lau-Hawaii)
W71-07681

3B. Water Yield Improvement

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.

Available from the National Technical Information Service as PB-198 433, $3.00 in paper copy, $0.95 in microfiche. Philadelphia, University City Science Institute, Mar 22, 1971. 132 p, 12 fig, 19 tab, 43 ref. USCI-ES-3.

Descriptors: *Water management (Applied), *Water resources development, Cost-benefit analysis, Technical feasibility, Water supply, Water demand, Reservoirs, Dams, Inter-basin transfer, Artificial recharge, Ecology, Recreation.
Identifiers: *New Castle County, Delaware, Schuylkill River, Susquehanna River.

This study concludes that current water demand exceeds current safe yield in New Castle County, Delaware, that the deficit may increase by 2 to 3 million gallons per day in the near future, and that, from the economic and engineering viewpoints, the proposed White Clay Creek Dam and Reservoir has the greatest prospect of any proposed project for increasing water supply. Previous engineering, economic, and feasibility studies of the water resources and demand projections in the county are reviewed. Aspects discussed include: projected water demand and county needs, an economic analysis of the White Clay Creek Dam and Reservoir proposal, other currently feasible alternatives, groundwater development, a study of the ecological and aesthetic aspects of the reservoir site, and a projection of economic conditions and financing alternatives. Other alternatives discussed include an interbasin transfer from the Schuylkill and Susquehanna Rivers to the White Clay Creek, proposed by the Mason-Dixon Task Force, and a large-scale artificial groundwater recharge project. (Dorr-UCSC)
W71-07064

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W71-07202

FINAL REPORT ON RESEARCH AND ENGINEERING DEVELOPMENT AND EVALUATION OF ICE NUCLEI DISPERSION SYSTEMS, MAY 1, 1967 TO MAY 1, 1970.
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.

Available from National Technical Information Service, as PB-196 149, $3.00 in paper copy, $0.95 in microfiche. Colorado State University, Atmospheric Simulation Laboratory Report 1970. 61 p, 39 fig, 8 ref, append. Bur Reclam Contract No 14-06-D-6170.

Descriptors: *Cloud seeding, *Silver iodide, *Equipment, Weather modification, Condensation, Water management (Applied).
Identifiers: *Silver iodide sources, *Nuclei generators.

Design and development of ground and airborne steady-state ice nuclei generators for field application are described. Performance, reliability, ease of maintenance, simplicity, and cost improvements were necessary and were accomplished. Units were needed capable of remote operation. Design of a new prototype generator with improved performance is described; nucleating materials, carriers, and fuels are discussed; and results of extensive field tests are given. (Knapp-USGS)
W71-07243

CRISIS IN WATER SUPPLY,
For primary bibliographic entry see Field 06B.
W71-07282

WATER FOR THE FUTURE OF LONG ISLAND, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 06B.
W71-07293

3C. Use of Water of Impaired Quality

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05D.
W71-07152

CATFISH CULTURE IN EFFLUENT WATER,
State Coll. of Arkansas, Conway.
For primary bibliographic entry see Field 05C.
W71-07343

3F. Conservation in Agriculture

A DECADE OF STABILIZATION LAGOONS IN MICHIGAN WITH IRRIGATION AS ULTIMATE DISPOSAL OF EFFLUENT,
Williams and Works, Grand Rapids, Mich.
For primary bibliographic entry see Field 05D.
W71-07089

GROWTH AND PERFORMANCE OF COTTON IN A DESERT ENVIRONMENT: I. MORPHOLOGICAL DEVELOPMENT OF THE CROP; II. DRY MATTER PRODUCTION; III. CROP PERFORMANCE,
Cotton Research Corp., Namulonge (Uganda). Cotton Research Station.
A. B. Hearn.
Journal of Agricultural Science, Camb, 1969, Vol 73, No 1, I. p 65-74, II. p 75-86, III. p 87-97. 19 fig, 13 tab, 65 ref.

Descriptors: *Cotton, *Plant growth, *Plant morphology, *Environmental effects, *Fiber crops, Arid lands, Deserts, Planting management, Crop production, Crop response, Plant physiology, Flood irrigation, Alluvium, Sierozem, Soil-water-plant relationships, Varieties, Spatial distribution, Irrigation water, Equations, Economic efficiency, Effects, Photosynthesis, Leaves, Carbon dioxide, Light, Soil water, Evapotranspiration, Seeds.

Identifiers: *Dry matter production, *Plant requirements, Yemen, Dry weight, Unit leaf-area index, Beer's law.

Agriculture in southern Yeman is based on annual spate floods, deep alluvial soils, and deep-rooted crops such as cotton. General principles of cotton growth were studied under a variety of experiments in 1963 and 1964. The results of variety, sowing date, irrigation water and plant spacing tests indicate that morphological change and dry weight increase are linked to predict crop performance. An exponential equation is developed for dry weight and unit leaf-area index, based on Beer's Law as opposed to linear regression. Varieties and agronomic practices are discussed in economic terms. An empirical relationship between water, dry matter production and cotton seed yield is evaluated physically and biologically based on work by Penman and deWit, and practically based on commercial yields and watering rates. Experimental procedure for I includes number of mainstem notes, variety, water, branches, fruiting points, and treatment effects. Potential photosynthesis, leaf distribution, CO sub 2 exchange resistance, light, vegetative and reproductive growth are evaluated for II. Soil water, evapotranspiration, seed cotton, plant weight and structure, water, mainstem, fruiting points, and boll and fibre character are investigated in III. (Popkin-Arizona)
W71-07154

ROOT ELONGATION RATES OF COTTON AND PEANUTS AS A FUNCTION OF SOIL STRENGTH AND SOIL WATER CONTENT,
Alabama Agricultural Experiment Station, Auburn.
For primary bibliographic entry see Field 02G.
W71-07157

IRRIGATION RESEARCH PROGRESS REPORT 1970, OKLAHOMA IRRIGATION RESEARCH STATION, ALTUS, OKLAHOMA.
Oklahoma Irrigation Experiment Station, Altus.

Oklahoma State University, Agricultural Experiment Station, Progress Report, P-639, Sept 1970. 29 p.

Descriptors: *Irrigation practices, *Fertility, *Soil-water-plant relationships, *Water conservation, *Oklahoma, Varieties, Testing, Soil management, Insect control, Weed control, Fiber crops, Crop production, Cotton, Projects, Nitrogen, Vertilicillium, Wilting, Forages, Entomology, Cultivation, Grains (Crops), Soybeans, Sorghum, Wheat.
Identifiers: *Irrigated crops, Cropping systems, Row spacing, Seedbed preparation, Thermal effects, Leaf rust.

Research of the Oklahoma Irrigation Research Station at Altus during 1970 includes irrigation problems, soil fertility, variety testing, soil management, insect and weed control, cropping systems, and food, feed and fiber crops production. The field station in southwestern Oklahoma receives 24.5 inches of rainfall annually, and has an average summer and winter temperature of 83.0 and 43.0 degrees F. Soils are Tillman and Hollister clay loams with 0 to 1 percent slopes, and pH range from 6.5 to 8.0. Lower than average rainfall, and high temperatures reduced insect problems on cotton in 1970. Twenty-one current projects are summarized, 6 of which deal with irrigated cotton in terms of test varieties, verticillium wilt, nitrogen-verticillium interaction and row spacing. One project involves testing establishment and management of forages. Other projects include weed control, entomology and cotton fertility, seedbed preparation, tillage and thermal effects, small grains and leaf rust, and soybean, grain sorghum and wheat investigations. Most results are forth coming, as experiments require more years of data. (Popkin-Arizona)
W71-07158

PRODUCING WATERMELONS IN KANSAS,
Kansas State Univ., Manhattan. Dept. of Horticulture and Forestry.
Charles V. Hall.
Kansas State University, Agricultural Experiment Station, Bulletin 532, Feb 1970. 16 p, 2 tab, 17 fig. Kansas Agricultural Experiment Station Contribution No 455.

Descriptors: *Crop production, *Melons, *Kansas, *Plant growth, *Irrigation practices, Vine crops, Root systems, Field capacity, Fruit crops, Sands, Plant diseases, Flowering, Crop response, Consumptive use, Soil moisture, Drought resistance, Marketing, Harvesting, Weed control, Insect control, Mulching, Planting management, Fertilization, Irrigable land, River beds, Varieties, Soil water, Soil-water-plant relationships.
Identifiers: *Growing season, *Crop requirements, Ripening, Storing, Handling, Transplanting, Site selection, Soil preparation.

Watermelons, which serve as an important water source in central and arid Africa, survive the desert climate, and absorb and store soil water. Varieties are grown in Kansas along river valleys, in sandy soils, and in irrigated semiarid areas. Growing technique and problems are discussed under site selection and soil preparation, fertilization, planting or transplanting, plastic mulches, irrigation, and control of insects, disease and weeds. Harvesting, handling, storing and marketing techniques are outlined. Irrigation is necessary in western Kansas and beneficial in eastern Kansas, though watermelons are fairly drought resistant. Soil moisture throughout the early growing season must be adequate to maintain healthy growth and yield vigorous blossoms. Healthy watermelons permit irrigation reduction during ripening. Watermelons benefit from irrigation if soil moisture content is low, when vining starts, when blossoms appear, and as fruit are growing. Water applied should bring soil moisture to field capacity 2 to 3 feet deep because of the deep-root system. (Popkin-Arizona)
W71-07160

THE ARIZONA LETTUCE INDUSTRY: COMPETITION, PRICES, DEMAND, SUPPLY CONTROL,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Robert S. Firch, and Daniel W. Mathews.
Arizona Agricultural Experiment Station, Technical Bulletin 188, Jan 1971. 10 p, 6 tab, 4 fig, 3 ref. Regional Research Project WM-58.

Descriptors: *Arizona, *Lettuce, *Competition, *Prices, *Demand, Water conservation, Fertilizers, Benefits, Economics, Profit, Costs, Organizations, Income, Optimization, Stabilization, Seasonal, Quality control, Harvesting, Varieties, Supply, Crop production, California, Arid lands.
Identifiers: *Supply control, Irrigated crop, Shipping costs, Harvest costs, Quantity sold, FOB Price, Grower net revenue, Salinas (Cal), Yuma (Ariz), Imperial Valley (Cal).

Lettuce, an important irrigated crop in the arid southwest, is a dynamic industry, where California and Arizona produce 80% of the total supply for the US and Canada. Arizona is too warm for commercial summer production; the Salinas area of California produces summer lettuce; Arizona's Yuma area and California's Imperial valley are the principal winter production areas. This paper, based on Mathews' masters' thesis, briefly discusses competition among western producing areas, Arizona lettuce prices and demand, and supply control and potential effects on grower net revenue. A total of 21,846 thousand cartons of lettuce were produced in Arizona in 1964-70, compared to a peak of 24,280 thousand cartons in 1961-62, and a low of 12,664 thousand cartons in 1949-50; commercial production began in Arizona in 1947-48. Lettuce prices reflect varieties changes, harvesting selectivity, and market effects of quality differences. Spring demands are stronger than winter demands. The following formula is developed to optimize and stabilize crop profits by industrial organizations. Grower Net Revenue equals (FOB Price times Quantity Sold)- (Harvest and Shipping costs). (Popkin-Arizona).
W71-07162

THE EGYPTIAN AGRARIAN REFORM: PROBLEMS AND PROSPECTS,
S. C. Schmidt.
Economic Planning, Vol 6, No 2, p 7-9, Mar-Apr 1970.

Descriptors: *Arid lands, *Economic impact, *Irrigated land, *Land uses, Political aspects, Fertilizers, Planning, Economic efficiency, Cooperatives, Economic feasibility.
Identifiers: *Egypt, *Agrarian reform, *Nile River.

In Egypt, rainfall is negligible, and there is total reliance on the Nile River for irrigation water. Only 3.5% of the land area is under cultivation, almost all of it being in the Nile valley. Because of its limited physical resources, Egypt has only 2 possible avenues for agricultural development: (1) Bringing more land into production, which would have to be desert land, and would therefore be extremely expensive; (2) Intensification of cultivation in available land which is represented mainly by the Aswan High Dam. Until desalinization becomes economically feasible, further intensification will be vertical and through improvement of irrigation by improvement of the country's weak drainage system, more mechanization, and better fertilizer practices. Egyptian agriculture is labor-intensive and highly productive. Nevertheless, by 1963, she had become a net food importer, reflecting the combined effects of higher population and upgraded diets. Agriculture accounts for 27% of the GNP and industry accounts for 23%, but national policy has been to increase the industrial sector because it is far less intensified than agriculture, and should yield greater output/unit input. Unfortunately, so far the industrial sector has not absorbed much labor. Since 1952, extensive agrarian reform has taken place and many of the big landlords have been eliminated. Most agricultural output is still private, but the agrarian reform succeeded, without harming production, because of the government's takeover and improvements of vital services-credit, marketing, cooperatives, irrigation, drainage and land reclamation. (Casey-Arizona).
W71-07163

COTTON RESEARCH STATION PROGRESS REPORT--1969, CHICKASHA, OKLAHOMA.
Oklahoma State Univ., Chickasha. Cotton Research Center.

Oklahoma State University, Agricultural Research, Progress Report P-622, Sept 1969. 24 p.

Descriptors: *Cotton, *Crop production, *Crop response, *Soil-water-plant-relationships, Forages, Soybeans, Oklahoma, Irrigation programs, Strain, Verticillium, Wilting, Nitrogen, Harvesting, Varieties, Fiber crops, Fertilizers.
Identifiers: Row spacing, Lint production, Nursery studies.

Progress reports on 15 cotton, 4 forage and 1 soybean studies at the Cotton Research Station, Oklahoma State University, for 1969 are summarized. One soybean and four cotton projects are irrigation studies where advanced and glandless strains, verticillium wilt, nitrogen-verticillium, hand-harvested varieties, and soybean row spacing are evaluated. Paymaster 54B had the highest lint yield at 596 lbs. Nursery studies exhibited acceptable fiber properties. Optimum amount of nitrogen fertilizer to minimize verticillium is investigated. Determination of soil-water-plant relationships and farm management which increases crop production are general research goals at the station. (Popkin-Arizona).
W71-07164

TURNING POINTS IN TIME--LAND/WATER/PEOPLE.

Available from Soil Conservation Society of America, 7515 Northeast Ankeny Road, Ankeny, Iowa, 50021, Price $5.00. Proceedings 25th Anniversary Meeting of the Soil Conservation Society of America, Aug 9-12, 1970, York University, Toronto, Ontario, Canada: Soil Conservation Society of America, 1970. 185 p.

Descriptors: *Soil conservation, *Water conservation, *Reviews, *Documentation, *Conferences, Environment, Ecology, Water resources development, Erosion, Sedimentation, Vegetation, Recreation, Wastes, Water pollution, Land use.
Identifiers: *Conference proceedings.

The proceedings of the 25th anniversary meeting of the Soil Conservation Society of America, August 9-12, 1970, at York University, Toronto, Ontario, Canada, included 27 papers concerning waste utilization, land resources, water pollution, water management, water research, soil and water conservation, erosion and sedimentation, natural vegetation, and outdoor recreation. (Woodard-USGS)
W71-07294

COST OF PUMPING IRRIGATION WATER IN ARIZONA: 1891 to 1967,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06C.
W71-07501

GENERATING SKILLED MANPOWER FOR IRRIGATION PROJECTS IN DEVELOPING COUNTRIES: A STUDY OF NORTHWEST MEXICO,
Inter-American Development Bank, Washington, D.C.
I. Haissman.
Water Resources Research, Vol 7, No 1, Feb 1971, p 1-17. 3 tab.

Descriptors: *Irrigation programs, Systems analysis, *Personnel management, Linear programming, Land tenure.
Identifiers: *Mexico, Ejidos.

A simple, practical method for finding the numbers of skilled personnel necessary for the successful implementation of irrigation projects in developing countries, and for designing a training system to generate this personnel is given. The occupations critical to irrigation development and the agricultural activities in which each occupation is deployed are listed. A series of coefficients, based mainly on the successful irrigation development in Northwest Mexico, determines the manpower quantities required as functions of given project parameters. A network flows model and a linear programming model are developed for designing the appropriate training systems. (Holmes-Rutgers)
W71-07505

ECONOMIC IRRIGABILITY OF THE SOILS OF ROOSEVELT COUNTY, NEW MEXICO, 1967,
New Mexico State Univ., University Park. Dept. of Agricultural Economics.
Peter H. Metzner.
New Mexico State University, Las Cruces, New Mexico, M. S. Thesis, Oct 1969. 84 p, 18 tab, 8 fig, 22 ref, 2 append.

Descriptors: *Irrigation efficiency, Economic prediction, Costs, Sorghum, Cotton, Peanuts, *Soil classifications, *New Mexico.
Identifiers: Roosevelt County (N Mex).

The author attempted to develop an analytical model for studying the economic potentialities of several types of soil when irrigated. He limited his study to five types of soils in Roosevelt County in eastern New Mexico and collected production data for cotton, sorghum, and peanuts on each soil type. Through the use of crop enterprise budgeting and multiple regression analysis, the author compared gross and net returns for each crop on each soil. He concluded that his choices of soils were too similar to reflect statistically significant differences. (Holmes-Rutgers)
W71-07506

SUGAR CANE IRRIGATION: A CASE STUDY IN CAPITAL BUDGETING,
McKinsey and Co., Inc., San Francisco, Calif.
For primary bibliographic entry see Field 06B.
W71-07578

CONSIDERATIONS FOR WATER USE AND MANAGEMENT IN THE BIG LOST RIVER BASIN, IDAHO; A SUPPLEMENTAL REPORT,
Geological Survey, Boise, Idaho. Water Resources Div.
E. G. Crosthwaite, C. A. Thomas, and K. L. Dyer.
Geological Survey Open-file Report, 1970. 15 p, 1 fig, 1 tab, 2 ref.

Descriptors: *Water management (Applied), *Irrigation water, *Conjunctive use, *Water storage, *Groundwater recharge, Water spreading, Irrigation efficiency, Reservoir design, Reservoir yield.
Identifiers: *Big Lost River Basin (Idaho).

Additional management of the surface-water resources in the Big Lost River basin, Idaho, is needed to (1) supply irrigation requirements during drought years, (2) provide increased flood control, and (3) insure more efficient use of the water supply available in normal years. Annual flow at Arco ranged from 0 to 195,500 acre-feet during the period 1944, 1947-68. Also, although an average of only about 7,000 acre-feet per year (10 cfs) passed the gage during the dry period 1960-64, the annual flow exceeded 100,000 acre-feet (138 cfs) in 5 years of the 23-year period 1944, 1947-68. An average annual flow of 55,900 acre-feet (77 cfs) left the basin during the period. Much of the water could be saved by prolonging the use of the storage space available in Mackay Reservoir, by construction of additional reservoirs, by increased diversion of upstream flows onto the Chilly-Barton Flats and thereby increasing the amount of water temporarily retained in the underlying aquifers, and by increasing irrigation efficiencies. (Knapp-USGS)
W71-07633

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME II, RESERVOIR REGULATION: SOME TECHNIQUES AND RESULTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-07060

AN APPROACH TO RESERVOIR TEMPERATURE ANALYSIS,
Corps of Engineers, Sacramento, Calif.
For primary bibliographic entry see Field 06A.
W71-07072

OPTIMAL POLICY FOR OPERATION OF A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C. Water Resources Research Inst.
B. J. Prochaska, and C. B. Russell.
Available from the National Technical Information Service as PB-198 520, $3.00 in paper copy, $0.95 in microfiche. Report No 18, Jan 1971. 54 p, 10 fig, 3 ref. OWRR Project A-018-SC (1).

Descriptors: *Mathematical models, *Optimization, *Dynamic programming, *Multipurpose reservoir, Reservoir management, *Reservoir operation, Operations research, Hydroelectric power, Statistical models, Economics, Inflow, Low-flow augmentation, Water level fluctuation.
Identifiers: Probabilistic dynamic programming, *Optimal control, Operating policy, Stochastic inputs, Optimal strategies, Auxilary power.

A mathematical model of a multipurpose reservoir is formulated taking into account such factors as: flow augmentation, the stochastic nature of inputs, requirements on the reservoir level, and the hydroelectric function of the reservoir. Based on the model an optimal solution to the problem of allocation of the impounded water is determined. These optimal polices or strategies are determined by (probabilistic) dynamic programming for which the objective is to minimize the expected total discounted cost over a finite horizon. These general results are in the form of theorems, some of which are represented graphically. A numerical example, to illustrate the results, and general implementation remarks are included.
W71-07133

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 06A.
W71-07134

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
L. R. Heiple, and H. M. Jeffus.
Available from the National Technical Information Service as PB-198 522, $3.00 in paper copy, $0.95 in microfiche. Water Resources Research Center, Publication No 7, 1970. 149 p, 19 fig, 22 tab, 5 ref, 4 append. OWRR Project B-001-ARK (3).

Descriptors: *Flow rates, *Reservoir storage, Storage, Withdrawal, Distribution, *Planning, Arkansas, Oklahoma, *Interstate compacts.
Identifiers: Monthly fows, Flow frequency, Maximum storage, Maximum withdrawal.

The primary goal of this study was to review, analyze, and correlate previously collected hydrologic data for use by the Arkansas-Oklahoma Compact Committee in apportioning the joint water resource of the respective states. The objectives of this project included to determine stream discharge throughout the base period of study for all major watercourses flowing between the two states, a statistical review of the stream flows derived above to provide usable flow data based on various recurrence intervals, to consider conservation storage feasibility at various sites, and to review water quality, predict the effect of reservoir storage and the future use of these streams. The results included mean monthly flow data for gaging sites where major streams cross the Arkansas-Oklahoma state line, flow frequency studies of all gaging stations within the Compact area of interest, and the development of reservoir storage procedures which permit the sizing of reservoirs at a chosen stream location. (Babcock-Arkansas)
W71-07135

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
Frank W. Haws.
Utah State University, Logan, Water Research Laboratory Report PR-WG-40-4, Feb 1970. 79 fig, 50 tab.

Descriptors: *Maps, *Land use, *Water utilization, *Land classification, Vegetation, Crops, Watersheds (Basins), Utah, Water resources development, Planning, Drainage districts.
Identifiers: *Water related land use, *State water plans, Weber River Drainage Area.

In developing a state water plan, it is essential to know the amount of water depleted from a natural drainage basin through evaporation and transpiration. In order to estimate water loss, the types and amounts of crops produced, as well as types and amounts of non-crop vegetation, must be known. Using aerial photographs projected on a base map, as well as on-the-ground surveys, 29 types of water-related land use have been plotted, and many maps showing the amount and type of water-related land use are included. Tables give the number of acres per section under each type of land use. (Yensen-Arizona)
W71-07167

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 06B.
W71-07172

WATER-SEWER AND DRAINAGE PLAN FOR FORT SMITH URBANIZING AREA-PHASE II.
Arkhoma Regional Planning Commission, Fort Smith, Arkansas.
For primary bibliographic entry see Field 05D.
W71-07191

A STUDY OF STORM-WATER INLET CAPACITIES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 08B.
W71-07199

WHAT'S AHEAD FOR OUR PUBLIC LANDS,
For primary bibliographic entry see Field 06E.
W71-07227

PRELIMINARY DESIGN REPORT, URBAN STORM DRAINAGE MODEL CITIES--DENVER.
Denver Dept. of Public Works, Colo.

Wright-McLaughlin Engineers Consultants report for Waste Water Control Division, Department of Public Works, City and County of Denver, Jan 1971. 2 tab, 3 fig, 26 dwg, append.

Descriptors: *Storm drains, Design data, Urbanization.
Identifiers: *Model cities, *Urban storm drainage, Denver.

The investigation of the urban storm drainage problems, the development of the goals and objectives for the area, and the planning of suitable solutions as presented in this report have been related to the overall urban system of Model Cities and the adjacent City and County of Denver. The summary and conclusions relative to the urban storm drainage system of Model Cities study areas A, C, D, and G are as follows: (1) Poor urban storm drainage systems have significantly contributed to the depressed nature of the neighborhoods; (2) Health, security and welfare of residents can be materially improved by bettering the drainage system; (3) Potential for improving the study areas appears to be great; (4) The 1985 land use map, prepared by the City in 1966, is a reasonable projection of future land uses and urban drainage planning; (5) The future degree of imperviousness and runoff coefficients were chosen on the basis of the 1985 map; (6) Selection of the design storm frequency for design of the major drainage system ranged from 25 to 100 years; (7) Goals and objectives developed using an environmental design team; (8) No allowance was made for a future roof top ponding ordinance; (9) Numerous auxilliary benefits have been identified; (10) Existing drainage problems are tabulated in detail; (11) Recommended solutions are included; (12) The design criteria utilized is based upon the Urban Storm Drainage Criteria Manual of the Denver Regional Council of Governments; (13) A strategy for financing and implementation has been developed; (14) Legal aspects are presented in the appendix. (Wray-Chicago)
W71-07307

ENVIRONMENTAL POLICY: NEW DIRECTIONS IN FEDERAL ACTION, RESTRUCTURING FOR COORDINATIVE POLICY AND ACTION,
Indiana Univ., Bloomington.
Lynton K. Caldwell.
Public Administration Review, Vol 28, No 4, p 301-303, July-Aug 1968.

Descriptors: *Environment, Decision making, Federal government, *Social aspects.
Identifiers: *Environmental policy, Federal participation, Coordinative policy, Public response.

The concept of public responsibility for the quality of the environment and for maintaining its viability has not yet become firmly embodied in the public law. Certain aspects of environmental policy have achieved statutory status through legislation on behalf of public health, conservation, or urban planning. Yet these and other measures do not cumulate to give us a basic political or constitutional doctrine that would guide social conduct as it impinges upon the environment. There is a growing body of evidence that indicates the emergence of a concept of public responsibility for the environmental welfare of the American people. Yet granting evidence of public concern, and accepting the scientific arguments of need for positive public action, the establishment of environmental administration as a major coordinative and managerial task of government will not be easily achieved. It is therefore important to the values of responsible popular government and constitutional procedures that goals and guidelines be as clearly stated as possible. Current developments in public administration that will facilitate innovation in management are: (1) team direction, (2) intellectual commitment to a total systems or ecological approach, (3) matrix concept of organization, (4) increasing interaction of private industrial and academic sectors of society with government in goal-directed public enterprises, (5) cybernetics, information service, and computer technology provide improved tools for environmental management. In the management of environment, it will be necessary to restructure the public agencies. (Wray-Chicago)
W71-07310

ENVIRONMENTAL MANAGEMENT: WATER AND RELATED LAND,
Water Resources Council, Washington, D.C.
Henry P. Caufield, Jr.
Public Administration Review, Vol 28, No 4, p 306-311, July-Aug 1968.

Descriptors: *Environment, Management, Resource development, Decision-making.
Identifiers: *Environmental problems, Public policy, Water resources planning.

The current concern for environmental quality requires a major intellectual and cultural revolution that would affect private and public decision making. It has called upon Congress to enact numerous specific pieces of legislation; and upon the Executive Branch, generally, to administer all ongoing programs with an eye on enhancement of environmental quality. Water and related land resources management is a major area within the total scope of the new environmental management. The Water Resources Planning Act is aimed at better organization, coordination, and support of comprehensive water and related land resources planning. The basic objective in federal formulation of plans is to provide the best use of water and related land resources to meet all foreseeable short and long term needs. The Planning Act created the Water Resources Council and the provision for Federal-State River Basin Commissions. Both groups are composed of experts in the field and representatives of the states and federal agencies involved. In hopes of promoting consensus, the Act directs the presidentially appointed chairman to act as coordinator of the federal members and to represent the federal government in federal state relations on the commission. (Wray-Chicago)
W71-07311

ENVIRONMENTAL POLICY AND THE CONGRESS,
Senate, Washington, D.C.
Henry M. Jackson.
Public Administration Review, Vol 28, No 4, p 303-305, July-Aug 1968.

Descriptors: *Federal government, Decision making, Environment.
Identifiers: *Environmental policy, Coordinated research, Senate Bill 2805.

In considering the degradation of our natural resources, it is necessary to establish a relationship to our environment in land, air, and water that will safeguard the physical and biological foundations on which well-being, prosperity, and security rest. Three changes are needed to reorder our priorities: (1) more effective process of policy review on matters of environment; (2) more aggressive and coordinated research on environmental problems and policies; (3) greater willingness by Congress to provide oversight on behalf of the public interest. In spite of reluctance to increase federal spending on environment when other expenditures are so high, Senate Bill 2805 calls for the establishment of a national program of environmental quality control, to better organize the federal structure to deal with its broad responsibilities. (Wray-Chicago)
W71-07312

FEDERAL POLICY PLANNING FOR THE MARINE ENVIRONMENT,
National Council on Marine Resources and Engineering Development, Washington, D.C.
Edward Wenk, Jr.
Public Administration Review, Vol 28, No 4, p 312-320, July-Aug 1968. 1 tab.

Descriptors: *Federal government, Planning, Coasts.
Identifiers: *Marine environment, Marine Resources and Engineering Development Act, Marine Science Council, Food-from-the-sea, Port development, Mapping the continental shelf.

The Marine Resources and Engineering Development Act, passed in June 1966, was enunciated to improve scientific understanding of the oceans, to accelerate their exploration, and to assert a national consensus that untapped marine resources should be developed to serve mankind's broadest needs and aspirations. This paper is concerned with the relationship of the marine environment to our national interests. In the Act, the President is given responsibility to implement the legislation: by developing a comprehensive program, by establishing long-range studies, by clarifying responsibility where missions cross agency lines, and by evaluating the government's program annually. To advise and assist the President are the National Council on Marine Resources and Engineering Development plus a professional staff. Specific areas of concern by the Marine Science Council include (1) expansion of international cooperation in ocean exploration, (2) intensification of food-from-the-sea efforts, (3) fostering rational development of the coastal zone, (4) preparation for new programs for port development, (5) insuring the safety of life and property along the coasts, (6) increasing sea grant program investments, (7) fostering marine applications of new technology, (8) intensification

of work in deep ocean technology, (9) increasing Arctic and subpolar research, (10) encouragement of international regional cooperation, (11) continuation of mapping the continental shelf. (Wray-Chicago)
W71-07313

ENVIRONMENTAL MANAGEMENT AND THE DEPARTMENT OF THE INTERIOR,
Department of the Interior, Washington, D.C.
Stanley A. Cain.
Public Administration Review, Vol 28, No 4, p 320-326, July-Aug 1968.

Descriptors: *Environment, *Management, Natural Resources, Ecology, Conservation, Federal government, Decision-making.
Identifiers: *Department of the Interior, Resource policy, Government agencies.

This paper looks at government response to environmental problems, especially by the Department of the Interior. Terms, such as environment, natural resources, human resources, ecology, and conservation are defined. The Department of the Interior is described as a sprawling organization with so many statutory missions that it can do no more than suggest programs for environmental management. The National Park System and Bureau of Sport Fisheries and Wildlife have had tremendous influence on public concern for conservation and the destructive processes affecting our environment. The Bureaus of Outdoor Recreation, of Commercial Fisheries, and of Land Management are clearly and properly orientated to human needs. The Bureau of Indian Affairs and Office of Territories are similar in that they assist in the management of land and water resources, but differ in that the human interests are principally those of the residents. The Geological Survey and Bureau of Mines are aimed at minimizing ecological disturbances while providing maximum goods and services to the nation. The Bonneville Power Administration markets power from federal hydroelectric projects in the Pacific northwest, and is concerned with the physical and social effects of its program. The Bureau of Reclamation does research to aid development and conservation of water resources. The Office of Water Resources Research seeks to stimulate, sponsor, and supplement present programs of research and training in the field of water. The difficulty in defining goals for the Department of the Interior is determining which goals have priority. A promising solution for intra-departmental conflicts is more widely based planning sessions with members from various agencies. (Wray-Chicago)
W71-07314

ESTABLISHMENT OF A DEEP-SEA TERMINAL OFF THE TEXAS GULF COAST,
South Texas Regional Export Expansion Council.
Ray R. Brimble.
Water Spectrum, Army Corps of Engineers, p 10-12, Spring 1971.

Descriptors: *Harbors, Transportation, Port authorities.
Identifiers: *Deep-sea terminal, International trade, Superships, Texas Gulf Coast.

Texas port leaders have decided to explore the feasibility of a gulf offshore terminal believing that such a facility would greatly benefit Texas ports, industries, and consumers. Advocates for construction of deep-sea terminals feel the construction is inevitable if the economic benefits for U.S. consumers and industries in the future are to be forthcoming. Due to their immense size, supertankers dictate immediate economic benefits to shippers and consumers. Areas unable to accommodate deep draft vessels will be deprived of such service and goods. In addition to generating a substantial flow of income and employment to deep-port areas in and out of the U.S., the intermediate and end products created will compete with similar U.S. products. Generally, lower initial costs due to volume transportation will give foreign products a decided advantage in world markets. Opponents of deep-sea terminals present evidence composed of historical research, financial dislocations, and lack of need. They also fear Federal control. The advocates, however, point out that there is great evidence supporting the need for deep-sea terminals off the Texas Gulf Coast. Cheap transportation of petroleum, iron ores, and bauxite is vital for international trade competition. The Texas Gulf Coast area is suggested as the most suitable for developing these terminals. (Wray-Chicago)
W71-07318

THE CASE AGAINST FEDERAL DEVELOPMENT OF REGIONAL PORTS,
American Association of Port Authorities.
Alfred Hammon.
Water Spectrum, Army Corps of Engineers, p 7-9, Spring 1971.

Descriptors: *Harbors, Port authorities.
Identifiers: *Ports and harbors, Superships, Federal and local involvement, American Association of Port Authorities, National Capability Study.

The public port industry through the American Association of Port Authorities (AAPA) in September 1970, completed a report titled the 'National Channel Capability Study.' The goal of the study was to understand the trend toward such superships and to survey the interests and plans of U.S. public port agencies to accommodate them in the next 30 years. Individual port responses and regional or coastal assessments within as well as outside of the AAPA study effort indicate that 40 out of 50 ports considered Federal regional port development unnecessary, undesirable and thus unwanted. The public port agencies in the U.S. are traditionally state, county, or municipal, and they pride themselves in avoiding Federal aid and securing private investment. They suspect that a Federal port scheme could seriously disrupt local port investment. Also, smaller ports see no future involvement in the supership problem, and thus have more to lose than to gain from expanded Federal port activity. Indeed, all ports have a major fear that commencement of Federal regional port development studies will bring about the termination of specifically authorized channel improvement study, construction, and maintenance projects urgently needed to fill more immediate or shorter term requirements. The need for, interest in and support for Federal approaches to regional port development by the public port industry thus is narrowed to those very few instances in which supership size pressures are such that can only be met through improvements to existing channels at a clearly unreasonable cost. The National Channel Capability Study has established that the supership problem is essentially confined to bulk cargoes and relatively few ports. (Wray-Chicago)
W71-07319

STOCHASTIC SIMULATION OF MONTHLY STREAMFLOW BY A MULTIPLE REGRESSION MODEL UTILIZING PRECIPITATION DATA,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 02A.
W71-07334

FLOATING VEGETATION OF LAKE KAINJI, NIGERIA,
Ife Univ. (Nigeria) Dept. of Biological Sciences.
A. M. A. Imevbore.
Nature, Vol 230, No 5296, p 599-600, Apr 30, 1971. 2 p, 11 ref.

Descriptors: *Aquatic drift, *Lakes, *Floating, *Vegetation, *Aquatic weeds, Weed control, Plants.
Identifiers: *Lake Kainji (Nigeria), *Africa, Pistia stratiotes.

Fears that Lake Kainji in Nigeria would become infested with the water weed Pistia stratiotes have not been borne out by recent events. This manmade lake now seems to be free of weed, in contrast to similar lakes elsewhere. Pistia and other potential weed could not form extensive mats at Kainji for two main reasons. First 70% of lake surface was cleared of vegetation and burnt before impoundment, which not only reduced the initial nutrient enrichment of the water but also retarded the growth of plants which would otherwise have been rapid within the quiet and stagnant water between trees standing in the lake. Frequent and regular winds also tended to destroy any mats which had formed. The most important reason is the hydrology of the lake. The ratio of outflow to volume of the lake is 4.1. Its mean retention time (capacity/inflow) has been calculated as 76 days. This means that the whole lake water is changed about four times per year. (Woodard-USGS)
W71-07602

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02E.
W71-07622

STREAM CHANNELS AND FLOW RELATIONS,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 02E.
W71-07624

CONSIDERATIONS FOR WATER USE AND MANAGEMENT IN THE BIG LOST RIVER BASIN, IDAHO; A SUPPLEMENTAL REPORT,
Geological Survey, Boise, Idaho. Water Resources Div.
For primary bibliographic entry see Field 03F.
W71-07633

A METHOD FOR FORECASTING SPRING RUNOFF FROM RIVERS IN THE DNIESTER BASIN (METODIKA PROGNOZA VESENNEGO STOKA REK BASSEYNA DNESTRA),
For primary bibliographic entry see Field 02E.
W71-07651

FOREST INFLUENCE ON RIVER FLOWS,
State Hydrological Inst., Leningrad (USSR).
A. P. Bochkov.
Extract from Proc 3rd All-Union Hydrological Congress, Vol 2, p 11-17, Hydrometeorological Pub House, 1959. Nature and Resources, Bulletin of the International Hydrological Decade, Vol 6, No 1, p 10-11, March 1970. 2 p, 1 fig.

Descriptors: *Vegetation effects, *Forests, *River flow, International Hydrological Decade, Hydrogeology, Soil-water-plant relationships, Runoff, Rainfall-runoff relationships, Infiltration, Groundwater movement, Surface-groundwater relationships.
Identifiers: European part of the USSR.

Data on more than 200 river basins of the European part of the USSR are used in graphs to show relations between average annual flow and the percentage of forest cover in different areas under conditions of average annual precipitation; relations between average annual flow and degree of latitude in regions with the same average precipitation; and relations between the percentage of forest cover and degree of latitude in regions with the same average precipitation. (Woodard-USGS)
W71-07689

4B. Groundwater Management

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 03B.
W71-07064

ANALYSIS AND EVALUATION OF PUMPING TEST DATA,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands); and Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02F.
W71-07166

SUBSIDENCE RESULTING FROM THE REMOVAL OF GROUNDWATERS,
For primary bibliographic entry see Field 06E.
W71-07209

WATER FOR THE FUTURE OF LONG ISLAND, NEW YORK,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 06B.
W71-07293

DYNAMIC PROGRAMMING FOR CONJUNCTIVE WATER USE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and California Univ., Davis. Dept. of Water Science and Civil Engineering.
Gert Aron, and Verne H. Scott.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY 5, Paper 8145, p 705-721, May 1971. 17 p, 8 fig, 2 tab, 10 ref, append.

Descriptors: *Dynamic programming, *Conjunctive use, *Optimization, Systems analysis, Water resources development, Recharge, Reservoirs, Aquifers, Planning.

Dynamic programming may be used to optimize the conservation and use of a conjunctive system of ground and surface waters involving several surface reservoirs, streams, recharge facilities, distribution pipelines, and aquifers. This complex system should be divided into several smaller and simpler subsystems. Wherever the interdependence of the subsystems is relatively small, the operations are optimized independently. The result is a system of a small number of state and decision variables with predetermined internal operative rules, which is then subjected to a conjunctive optimization. The method is applied to a water-allocation system to produce an optimal policy for 8 yr of operation in 3-month intervals. (Knapp-USGS)
W71-07616

DRILLER'S HANDBOOK NO. 1,
Petroleum Publishing Co., Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W71-07683

DRILLER'S HANDBOOK NO. 2,
Petroleum Publishing Co., Tulsa, Okla.
For primary bibliographic entry see Field 08A.
W71-07684

INTERPRETATION OF GEOPHYSICAL LOG IN BORES IN UNCONSOLIDATED SEDIMENTS, PHASE I,
Australian Water Resources Council, Sydney.
D. W. Emerson, and S. S. Webster.
Australian Water Resources Council, Research Project 68/7, Feb 1970 (Preliminary Edition). 211 p. Research Project 68/7, Phase I.

Descriptors: *Logging (Recording), *Water wells, Electrical logging, Radioactive logging, Groundwater, Hydrogeology, Borehole geophysics.
Identifiers: *Australia, *Groundwater investigations, Unconsolidated sediments, Practical quantitative analysis procedure, Calibration practices log interpretation procedures, Digital data acquisition.

This report covers the first phase of a two-phase project to investigate the interpretation of geophysical logs of water wells in unconsolidated sediments. Phase I of the project was designed to (1) appraise the well logging practices presently in use for groundwater investigation in Australia, (2) evaluate the geophysical well logging method in its application to unconsolidated sediments, (3) interpret selected well logs to estimate the possibility of this research project producing a practical quantitative analysis procedure. The investigation (1) above showed that the well logging practices are inadequate for a full evaluation of aquifers. A chapter concerning the standarization of gamma-ray logging is included. Present data presentation formats and radiation intensity units are shown to have little uniformity throughout Australia, while calibration practices are inadequate for the provision of accurate logs. Procedures to eliminate these deficiencies are outlined. A digital approach to data acquisition, storage and interpretation is discussed together with the description of an inexpensive, but efficient, magnetic tape recording system. Aquifer water salinity-resistivity relationships are analysed as are other aquifer parameters important to well log interpretations. The interpretation techniques employed in this report, though efficient, are provisional and should be expanded and improved during phase II of the research project. (Campbell-NWWA)
W71-07685

QUANTITATIVE WATER RESOURCE BASIN PLANNING: AN ANALYSIS OF THE PECOS RIVER BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Economics.
Ralph C. d'Arge.
WRRI Report No 8, Water Resources Research Institue, New Mexico State University, Las Cruces, 1970. 104 p, 6 fig, 69 tab, 43 ref, 10 append. OWRR Projects B-006-N MEX (2) and B-001-N MEX (2).

Descriptors: *Water allocation (Policy), *Water analysis, *Project planning, *Groundwater, *Linear programming, Water transfer, Constraints, Water users, New Mexico.
Identifiers: *Pecos River Basin.

An attempt to identify explicit policy choices for time-related reallocation of water resources within the Pecos River Basin in New Mexico was made. It was viewed as a 'closed water system' where a substantial amount of the basin's resources could be exhausted through runoff, evaporation, evapotranspiration, and groundwater mining. The report contained two major parts including a set of water requirements projections for major industrial, agricultural, and commercial water-using sectors in the Pecos Basin Five County Area (PBFCA) for the years 1980 and 2000, and an analysis of potential for intra-basin water transfers within the Pecos River Basin drainage area in New Mexico. Requirements projections developed in the first section were utilized as data inputs for the water transfer model developed in the second section. This model was of the linear programming type, containing an explicit objective function and a set of contraints on water-related activities. The initial planning objective was to reallocate existing stock and flow water sources between competitive users so as to maximize value added (gross output) of the Pecos Basin. Preliminary tests were made and results were given. Appendices gave specifics of the requirements projections. (Kriss-Cornell)
W71-07691

4C. Effects on Water of Man's Non-Water Activities

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07062

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
S. L. Johnson.
Geological Survey Data Report, 1970. 302 p, 14 fig, 14 tab, 6 ref.

Descriptors: *Streamflow, *Rainfall-runoff relationships, *Hydrologic data, *Urbanization, *Texas, Stream gages, Storm runoff, Peak discharge, Low flow, Average flow, Hydrographs, Mass curves, Cities, Data collections.
Identifiers: *Urban hydrology, Houston (Tex).

The Houston study area, centered about 45 miles from the Gulf of Mexico, is within a 1,000-square-mile area of land surface that increases in altitude from 35 feet above mean sea level in the southeast to 135 feet in the northwest. Records presented for the water year 1968 (October 1967-September 1968) include daily discharges at 33 continuous streamflow stations, annual maximum discharge at crest-stage partial-record stations, and daily rainfall from recording and nonrecording rain gages located at continuous streamflow stations and miscellaneous sites. Also included are individual storm analyses which show a mass curve for rainfall over a basin and mass curve and hydrograph of discharge from the basin, for those basins which are instrumented for more detailed study of rainfall and its relation to runoff. Average rainfall over the Houston metropolitan area during the 1968 water year was 51 inches, or 5 inches greater than the 30-year (1931-60) average for the Houston airport station. Two area-wide storms and one localized storm of unusual magnitude occurred during the year. (Woodard-USGS)
W71-07184

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-07241

THE EFFECTS OF URBAN DRAINAGE ON LAKE McILWAINE, RHODESIA,
For primary bibliographic entry see Field 05C.
W71-07524

CONFLICTS ARISING FROM THE USE OF SHORE PROPERTY ON THE GREAT LAKES,
Department of Public Works, Toronto (Ontario).
D. W. Quinlan.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 145-154, 1968.

Descriptors: *Great Lakes, *Land use, *Planning, *Conservation, Zoning, Taxes, Government, Flood plain, Scarcity, Cost-benefit analysis, Agriculture, Optimization, Investment.
Identifiers: *Urbanization, *Industrialization, Commercial-industrial development.

Conflicts are presented that exist between shore property users along the ten thousand miles of shoreline within the Great Lakes Basin. The multiplicity of users, each with its own peculiar requirements, is cited as the underlying cause for such conflict. Specific conflicts dealt with include those between urbanization and open land use, between agricultural and industrial use, and between commercial-industrial development and recreational needs. One problem directly connected to land use planning is the haphazard development which has been allowed in the flood plain. The rapid development of the shoreline area is cited as the cause of various economic difficulties which resulted in the need for increasing amounts of tax monies for resolution or alleviation of the difficulties. Improved land use planning and zoning is proposed to maintain a semblance of order for the co-existence of each interest and the maximum good of all interests, before the loss of the remaining open land around the Lakes can occur. (See also W71-07565) (Murphy-Rutgers)
W71-07571

4D. Watershed Protection

EROSION RATES IN THE STEVEVILLE BADLANDS, ALBERTA,
Alberta Univ., Edmonton.
For primary bibliographic entry see Field 02J.
W71-07165

TURNING POINTS IN TIME--LAND/WATER/PEOPLE.
For primary bibliographic entry see Field 03F.
W71-07294

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

EVALUATION OF PYRITIC OXIDATION BY NUCLEAR METHODS,
Carnegie-Mellon Univ., Pittsburgh, Pa.
Robert A. Baker.
Copy available from GPO, Sup Doc as SOD order No EP 2.10:14010F1103/71, $0.50; microfiche from NTIS as PB-198 523, $0.95. EPA-WQO Water Pollution Control Research Report, Mar 1971. 31 p, 11 fig, 5 tab, 11 ref. EPA-WQO Program 14010 FII.

Descriptors: *Mine drainage, Water pollution sources, Coal mines, Mine wastes, Spectroscopy, Analytical techniques, Mine acids, Acid mine water, Cobalt radioisotopes, Pyrite, Iron, Gamma rays.
Identifiers: *Moessbauer effect, *Backscatter detection, Iron-57, Cobalt-57, Nuclear resonance abosorption.

Laboratory studies demonstrated the feasibility of using the Mossbauer effect and a backscattering mode of detecting 14.4 Kev gamma rays to spectroscopically monitor the oxidation processes taking place on pyrite materials. A cobaltous oxide form of cobalt-57 was the radiation source. Spectra were obtained of pyritic surfaces under 2 mm of water. Differentiation of nonoxidized and oxidized pyritic surfaces was possible with further separation of the spectra to show individual oxidation product peaks suggesting ferric hydroxide and ferric sulfate.
W71-07137

PESTICIDES IN HATCHERY TROUT--DIFFERENCES BETWEEN SPECIES AND RESIDUE LEVELS OCCURRING IN COMMERCIAL FISH FOOD,
Pennsylvania State Univ., University Park. Pesticide Research Labs.
H. Cole, A. Bradford, D. Barry, P. Baumgarner, and D. E. H. Frear.
Pesticides Monitoring Journal, Vol 1, No 2, p 35-37, 1967. 2 tab, 4 ref.

Descriptors: *Pesticide residues, *Chlorinated hydrocarbon pesticides, DDT, Dieldrin, Heptachlor, Fish diets, Fish management, Brook trout, Brown trout, Rainbow trout, Gas chromatography, Analytical techniques.
Identifiers: *Fish foods, DDD, DDE, Heptachlor epoxide.

Samples of commercial fish food from four manufacturers and trout of three species, brook, brown and rainbow, were analyzed for persistent chlorinated pesticides. The trout were in the 8 to 9 inch size range at the time of analysis. Small quantities of heptachlor, heptachlor epoxide, dieldrin, DDE, DDT (TDE), o,p'-DDT, and p,p'-DDT were found in the fish food. One source contained all of the pesticides except DDD. The trout were analyzed on the basis of chloroform-methanol extractable lipids from the whole fish. The rainbow trout with one exception contained all seven pesticides. The rainbow trout contained greater quantities of all pesticides than the brook or brown trout. The brown trout contained significantly more heptachlor, heptachlor epoxide, dieldrin, DDE and DDD than the brook trout. (Sjolseth-Washington)
W71-07141

CHLORINATED PESTICIDE RESIDUES IN AN AQUATIC ENVIRONMENT LOCATED ADJACENT TO A COMMERCIAL ORCHARD,
Wisconsin Dept. of Agriculture, Madison.
R. J. Moubry, J. M. Helm, and G. R. Myrdal.
Pesticides Monitoring Journal, Vol 1, No 4, p 27-29, 1968. 4 tab, 4 ref.

Descriptors: *Pesticide residues, *DDT, *Dieldrin, *Endrin, *Aquatic environment, Chlorinated hydrocarbon pesticides, Gas chromatography, Benthic fauna, Bottom sediments, On-site investigations, Wisconsin, Silts, Orchards, Surface runoff, Caddis flies, Brook trout.
Identifiers: *Bottom organic matter, *Tissue analysis, DDD, DDE, Knight's Creek Wisconsin.

Samples of water, silt, bottom organic debris, bottom organisms and fish were collected from an aquatic environment (Knight's Creek, Wisconsin) located adjacent to a commercial orchard previously treated with endrin, dieldrin and DDT. Residue data obtained from the analysis of these samples are presented. The results obtained indicate that contamination of the environment studies was minimal. (Sjolseth-Washington)
W71-07142

MERCURY DETERMINATION IN FISH SAMPLES BY WET DIGESTION AND FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. F. Uthe, F. A. J. Armstrong, and M. P. Stainton.
Journal of the Fisheries Research Board of Canada, Vol 27, No 4, p 805-811, 1970. 6 fig, 5 ref.

Descriptors: *Spectrophotometry, *Test procedures, Analytical techniques, Heavy metals, Laboratory tests, Laboratory equipment.
Identifiers: *Mercury, Wet digestion, Tissue analyses.

A simple, rapid method is given for determination in fish of mercury at concentrations measured in parts per million (ppm). Samples are digested at 50-60 C with sulphuric acid and oxidized with permanganate. Mercury in the digest is determined by atomic absorption spectrophotometry. Recovery of mercury added to samples was complete, with good precision. Standard deviations from triplicate analyses were plus or minus 0.039 at the 0.1 ppm level and plus or minus 0.051 at the 0.5 ppm level. In a day, three workers analyzed 15-20 samples in triplicate. (Sjolseth-Washington)
W71-07148

IDENTIFICATION OF PETROLEUM PRODUCTS IN WATER,
Department of Energy, Mines and Resources, Ottawa (Ontario). Inland Waters Branch.
Adrian Demayo.
Canada Dept of Energy, Mines and Resources, Inland Waters Branch Technical Bulletin No 32, 1970. 22 p, 14 fig, 14 ref.

Descriptors: *Pollutant identification, *Oily water, *Laboratory tests, *Gas chromatography, Test procedures, Oil gasoline, Water pollution, Analytical techniques, Instrumentation.
Identifiers: *Oil spills.

This report describes an extraction method used to analyze water samples, and activated carbon samples through which water has been passed, for the presence of crude oil or other petroleum products. The chromatogram of a mixture of a series of hydrocarbons which was used to check the performance of the gas chromatographic system at various times is presented. The performance of the method was constant over the period of time during which this work was carried out. The chromatogram of a diesel oil and that of a gasoline are very different in their patterns. The range of carbon number is also different; in gasoline it ranges from C6 to C11 while in a diesel oil the range is from C10 to C18. (Woodard-USGS)
W71-07240

THE USE OF ULTRA-VIOLET ABSORPTION MEASUREMENTS FOR THE ESTIMATION OF ORGANIC POLLUTION IN INSHORE SEA WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Water Research, Vol 5, No 1, p 19-27, Jan 1971. 9 p, 7 fig, 7 ref.

Descriptors: *Pollutant identification, *Organic matter, *Sea water, *Spectrophotometry, Ultraviolet radiation, Analytical techniques, Spectroscopy.
Identifiers: *Ultraviolet absorption spectroscopy.

Changes in the ultraviolet absorption spectra of sea water at an inshore station were monitored. These changes were interpreted in terms of variable supply of organic matter from the major sources of land drainage and autochthonous biological activity. Differences in the molecular nature of the organic matter derived from these sources result in seasonal variations in both the degree of absorption per unit of dissolved organic carbon and the relative absorption within different wavelength regions. Hence, only a poor correlation was obtained between the ultraviolet absorption and the dissolved organic carbon content. Appreciable short term variations in spectra were also recorded. These variations severely limit the use of ultraviolet absorbance measurements for the indication of marine organic pollution. (Knapp-USGS)
W71-07256

AN IMPROVED DIANTHRIMIDE TECHNIQUE FOR THE DETERMINATION OF BORON IN RIVER WATERS,
Calgary Univ. (Alberta). Dept. of Geology.
A. A. Levinson.
Water Research, Vol 5, No 1, p 41-42, Jan 1971. 2 p, 6 ref. Canada National Research Council Grant A4383.

Descriptors: *Pollutant identification, *Boron, *Surface waters, *Analytical techniques,

*Colorimetry, Water analysis, Salinity, Water chemistry.
Identifiers: *Boron determination.

A modified dianthrimide method is described which is capable of detecting as little as 0.01 mg per liter boron in river water. The procedure is based upon the use of calcium hydroxide to fix the boron; this also permits rapid evaporation of the water sample without the loss of volatile borates. (Knapp-USGS)
W71-07257

IMPROVED CHEMICAL OXYGEN DEMAND APPARATUS,
Montgomery Research, Inc., Pasadena, Calif.
R. J. TeKippe, and R. G. Zehnpfennig.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 515-518, Mar 1971. 4 p, 2 fig, 1 ref.

Descriptors: *Water analysis, *Oxygen demand, *Chemical oxygen demand, *Chemical analysis, Equipment, Instrumentation, Dissolved oxygen.
Identifiers: *Chemical oxygen demand tests.

The conventional chemical oxygen demand test method, although becoming more popular than the 5-day biochemical oxygen demand test, still suffers from inconveniences inherent in the use of water-cooled condensers. Air-cooled condensers perform equally well, and with suitable timers can be operated automatically. The unit described has been in operation for over 6 yr and has proven satisfactory in every respect. (Knapp-USGS)
W71-07259

AVERAGE DISSOLVED OXYGEN--MEASUREMENT AND WATER QUALITY SIGNIFICANCE,
Geological Survey, Menlo, Calif.
Keith V. Slack.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 433-446, Mar 1971. 14 p, 5 fig, 3 tab, 41 ref.

Descriptors: *Dissolved oxygen, *Water analysis, Reviews, Analytical techniques, Water quality, Diurnal, Monitoring, Surveys, Diffusion, Osmosis.
Identifiers: *Dissolved oxygen measurement.

Available methods of obtaining dissolved oxygen (DO) data at water quality network stations have limitations of high cost, inconvenience of sampling for diel changes, or inadequacy of data for comparative purposes. The diel average DO concentration is better than a single daytime measurement for comparing DO conditions at different stations. Simple devices called DO integrators were developed for determining average DO concentration. The integrators are closed containers filled with water that contacts the environment through semipermeable diffusion barriers. Molecular oxygen diffuses through the barriers until oxygen pressures inside and outside the containers are equal. Diurnal and other short-period fluctuations in DO are smoothed out, and thus the integrator DO concentration is the average DO of the environment. Average DO concentrations, combined with measurements of instantaneous DO in late afternoon, provide a basis for estimating the nighttime extreme DO concentration. (Knapp-USGS)
W71-07260

DETERMINATION OF METHYLMERCURY SALTS IN VARIOUS KINDS OF BIOLOGICAL MATERIALS,
National Inst. of Public Health, Stockholm (Sweden).
Gunnel Westoo.
Acta Chemica Scandinavica, Vol 22, No 7, p 2277-2280, 1968. 5 ref.

Descriptors: *Heavy metals, Metals, Fish, *Analytical techniques, *Chemical analysis, Physicochemical properties, Water pollution, Bottom sediments, Benthic fauna, Benthos, Laboratory tests, Waste identification, *Pollutant identification.
Identifiers: Mercury, *Mercury pollution.

The cysteine acetate modification of the method for determining methylmercury salts in foods, which was useful for analysis of fish, egg white, and meat, was not efficient when applied to egg yolk with low methylmercury content, liver, sediments in aquaria, or sludge. Therefore some modifications of the procedure have been investigated. A combination of the mercuric chloride and cysteine acetate procedures gave good results for sediments in aquaria and sludge and could also be used for, e.g., fish, egg white, bile, kidney, blood, meat, and moss. Precipitation of the proteins with molybdic acid at the first extraction improved the results for liver but not for egg yolk. For egg yolk an increase of the concentration of the cysteine acetate solution from 1 to 10% gave 90% recovery of added methyl mercury, repeated extractions 100% recovery. (Novotny-Vanderbilt)
W71-07322

DETERMINATION OF METHYLMERCURY COMPOUNDS IN FOODSTUFFS, II. DETERMINATION OF METHYLMERCURY IN FISH, EGG, MEAT, AND LIVER,
National Inst. of Public Health, Stockholm (Sweden).
Gunnel Westoo.
Acta Chemica Scandinavica, Vol 21, No 7, p 1790-1800, 1967. 2 fig, 4 tab, 8 ref.

Descriptors: *Heavy metals, *Analytical techniques, Fish, Biochemistry, Organic compounds, Gas chromatography, Chemical analysis, Carbohydrates, Water pollution, Pollutant identification.
Identifiers: Mercury, *Mercury pollution, *Methylmercury.

The combined gas chromatographic and thin-layer chromatographic method for the identification and determination of methylmercury compounds in fish has been modified in order to render it applicable to a wider range of foods. In animal foodstuffs methylmercury is probably to a great extent attached to thiol groups. When these foods are extracted methylmercury chloride is formed and dissolves in the benzene together with varying amounts of thio compounds. Purification of the methylmercury in the benzene extracts of, e.g., egg yolk or liver by extraction with aqueous alkali solution did not work, probably because the thio compounds were not volatile and could form alkali-insoluble methylmercury salts. Evidently methylmercury-S-compounds were reformed at high pH and prevented the formation of the water-soluble methylmercury hydroxide. Addition of excess mercuric ions, which expelled the methylmercury from the thio compounds solved this clean-up problem. Samples of fish, egg-white, egg yolk, meat, and liver have been analyzed with the modified method. Extraction of the methylmercury into an aqueous phase was also possible with the aid of a water solution of cysteine. This led to a more rapid analytical procedure. (Novotny-Vanderbilt)
W71-07323

MERCURY ANALYSIS IN BIOLOGICAL MATERIAL BY DIRECT COMBUSTION IN OXYGEN AND PHOTOMETRIC DETERMINATION OF THE MERCURY VAPOUR,
Statens Provningsanstalt, Stockholm (Sweden).
V. Lidums, and U. Ulfvarson.
Acta Chemica Scandinavica, Vol 22, No 7, 1968, p 2150-2156.

Descriptors: *Heavy metals, *Analytical techniques, Metals, Biochemistry, Chemical analysis, Physicochemical properties, Laboratory tests, Waste identification, Biomass, Photometry, *Pollutant identification.
Identifiers: Mercury, *Mercury pollution.

Mercury in small quantities in, for example, biologic material is determined by direct combustion in oxygen of samples weighing between 20 and 200 mg. The combustion gases are passed through different zones under temperature conditions carefully controlled to allow complete oxidation of organic material, but also to avoid the formation of mercury oxide. The mercury is temporarily collected on a gold filter. When all combustion products have passed through the system the mercury absorbed on the gold is released by heating, and the mercury vapour is determined photometrically by means of ultraviolet light absorption at 253.7 nm. The reproducibility of the method is good; the difference between duplicate analyses is mostly less than 10%. Samples containing about 1 ng of mercury per g may be analysed without difficulties. (Novotny-Vanderbilt)
W71-07327

A NEW AUTOMATIC DETERMINATION OF OXYGEN IN ORGANIC SUBSTANCES BY COLORIMETRIC TITRATION, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A.G., Ludwigshafen am Rhein (West Germany).
Wolfgang Merz.
Analytica Chimica Acta, Vol 51, No 3, p 523-526, 1970. 1 fig, 5 ref.

Descriptors: *Colorimetry, *Analytical techniques, *Oxygen, *Organic matter, Measurement, Volumetric analysis, Automation.
Identifiers: Carbonic acid.

The introduced assembly for automatic determination of oxygen in organic substances utilizes colorimetric titration of carbonic acid. The time for a complete analysis of one sample varies between 14 and 18 minutes. In routine analyses approximately 40 determinations are made per working day. Employment of an electronic scanner with corresponding counter would appreciably increase the efficiency of the assembly. (Wilde-Wisconsin)
W71-07349

PHOTOSYNTHETIC COEFFICIENT AS A FUNCTION OF THE COMPOSITION OF PLANT BIOMASS, (IN RUSSIAN),
Institut Mediko-Biolozicheskikh Problem, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W71-07359

A NEW REAGENT FOR THE DETECTION AND DETERMINATION OF SMALL AMOUNTS OF THE SULPHATE ION,
Birmingham Univ. (England). Dept. of Chemistry.
William I. Stephen.
Analytica Chimica Acta, Vol 50, No 3, p 413-422, June 1970. 2 fig, 1 tab, 6 ref.

Descriptors: *Sulfates, Analytical techniques, Chemical precipitation, Sulfur, Organic compounds, Ions, Sulfur, Oil.
Identifiers: *2-aminoperimidine hydrochloride, Reagents.

An aqueous solution of 2-aminoperimidine hydrochloride is proposed as a new reagent for the detection and determination of the sulphate ion. As little as 0.05 p.p.m. can be detected by precipitation of the corresponding amine sulphate. Suspensions of the precipitate show remarkable stability and no colloidal stabilizers are needed. The reagent is applied to the nephelometric determination of 0.1-5 p.p.m. of sulphate ion; at the 0.5 p.p.m. level, the relative standard deviation is 4.5 percent. Although many ions form precipitates with the reagent at high concentrations, very few of the common anions provide significant interference in the nephelometric determination. The reagent seems promising for the determination of sulphate in natural waters, and for traces of sulfur in organic compounds such as hydrocarbon oils after oxygen flask combustion. (McCann-Battelle)
W71-07385

IMMUNOFLUORESCENT IDENTIFICATION OF TYPE 12 GROUP A STREPTOCOCCI,
New York State Dept. of Health, Albany. Div. of Labs. and Research, and Connecticut State Dept. of Health, Hartford. Lab. Div.
William F. Vincent, Kathleen J. Lisiewski, and William W. Ullmann.
Applied Microbiology, Vol 20, No 4, p 590-592, Oct 1970. 3 tab, 8 ref.

Descriptors: *Streptococcus, *Cultures, *Pollutant identification, Diolysis, Analytical techniques, Human disease, Public health.
Identifiers: *Fluorescent antibody staining, *Serotyping, Streptococcus pyogenes type 12, Sequelae.

Fluorescent antibody (FA) staining techniques were applied successfully to the serotyping of type 12 streptococci. The FA conjugate prepared by labeling streptococcal M type 12 antibody with fluorescein isothiocyanate was found to exhibit considerable nonspecific FA staining with other group A M-serotypes. The cross-reactions could be reduced sufficiently or eliminated by the addition of adsorbed homologous blocking serum (AHB) but not by preimmune serum. The AHB was prepared by adsorbing type 12 antiserum with untreated homologous cells. Comparative straining with unblocked and AHB-blocked FA conjugates enabled type 12 streptococci from clinical specimens to be rapidly and accurately identified. The nature of the serum constituents responsible for blocking is not known but is assumed to be antibody to certain common antigens shared by the streptococci. (Mortland-Battelle)
W71-07386

EFFECTS OF ALKYLBENZENE SULFONATES ON YEASTS,
Georgia State Univ., Atlanta. Center for Disease Control.
P. G. Standard, and D. G. Ahearn.
Applied Microbiology, Vol 20, No 4, p 646-648, Oct 1970. 1 fig, 3 tab, 8 ref.

Descriptors: *Yeasts, *Alkylbenzene sulfonates, *Detergents, Industrial wastes, Sewage, Surfactants.
Identifiers: Hansenula, Candida.

Certain strains of two yeast species (Hansenula and Candida) were found to be resistant to high concentrations of anionic alkylbenzene sulfonates and to degrade subinhibitory concentrations of these detergents. This suggests the use of these yeasts in removing alkylbenzene sulfonates from sewage or industrial wastes. High detergent densities showed a selective effect on yeasts, and may be a factor in explaining the prevalence of Candida krusei in sewage and urban waters. (Mortland-Battelle)
W71-07387

MEDIUM FOR DIFFERENTIAL COUNT OF THE ANAEROBIC FLORA IN HUMAN FECES,
Utrecht Rijksuniversiteit (Netherlands). Microbiology Lab.
J. A. A. Van Der Wiel-Korstanje, and K. C. Winkler.
Applied Microbiology, Vol 20, No 1, p 168-169, July 1970. 3 fig, 13 ref.

Descriptors: *Anaerobic bacteria, *Pollutant identification, Cultures, Microscopy, Analytical techniques, Sewage, E. coli, Salmonella, Bioindicators.
Identifiers: *Feces, Bacteroides, Bifidobacteria, Klebsiella, Enterobacter, Proteus, Fusobacterium.

A method for differential counting of gram-positive and gram-negative anaerobes in human feces on one plate is presented. Some types of bifobacterium can be identified tentatively by colony form alone or by colony form and microscopy. Reinforced clostridial agar with 1 percent glucose was used as base medium. Horse blood (7.5 percent) and China blue (0.03 percent) were added after sterilization and cooling to 50C. Organisms of the bacteroides group grew with blue translucent colonies, whereas bifidobacteria grew with opaque brown colonies. Strains of other gram-negative bacteria such as Escherichi coli, and the genera Klebsiella, Enterbacter, Salmonella, Proteus, and Fusobacterium also produced blue translucent colonies. (Mortland-Battelle)
W71-07388

YEASTS ISOLATED FROM THE SOUTH SASKATCHEWAN, A POLLUTED RIVER,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
J. F. T. Spencer, P. A. J. Gorin, and N. R. Gardner.
Canadian Journal of Microbiology, Vol 16, p 1051-1057, 1970. 3 fig, 4 tab, 18 ref.

Descriptors: *Yeasts, *Sewage effluents, Rivers, Sampling, Domestic wastes, Cultures, Isolation, Bionindicators.
Identifiers: *Proton magnetic resonance, Saskatchewan River (Canada) Canada.

Minimum numbers of yeasts isolated from the Saskatchewan River in the summers of 1964 and 1965 ranged from 400 to 500 cells/liter upstream from the city of Saskatoon, to 4600 cells/liter immediately downstream. In the summer of 1968, a period of extremely low water, the counts were 150 cells/liter upstream from the city and 30,000 cells/liter downstream. Proton magnetic resonance spectra of the mannose-containing polysaccharides from representative cultures of the different species isolated were used as an aid in classification. Most of the species were asporogenous, and included representatives of the genera Candida, Trichosporon, Rhodotorula, Torulopsis, and Crytococous. Some species of Pichia, Saccharomyces, and Debaryomyces were isloated. The yeasts were mostly introduced into the river with the effluent from the Saskatoon sewage system. (McCann-Battelle)
W71-07389

CHARACTERIZATION OF BOTTOM SEDIMENTS: CATION EXCHANGE CAPACITY AND EXCHANGEABLE CATION STATUS,
Rutgers-The State Univ., New Brunswick, N. J. Dept. of Soils and Crops.
For primary bibliographic entry see Field 02K.
W71-07390

INDIRECT SPECTROPHOTOMETRIC DETERMINATION OF CHLORIDE BY SOLVENT EXTRACTION AS TRIS (1,10-PHENANTHROLINE) IRON (II) THIOCYANATE,
Hiroshima Univ., (Japan). Dept. of Chemistry.
Y. Yamamoto, T. Kumamaru, A. Tatehata, and N. Yamada.
Analytica Chimica Acta, Vol 50, No 3 p 433-438, June 1970. 2 fig, 2 tab, 7 ref.

Descriptors: *Spectrophotometry, *Chloride, *Colorimetry, *Separation techniques, Fresh water, Sulfates, Phosphate, Fluoride, Carbonate, Potassium, Sodium, Sulphide, Analytical techniques.
Identifiers: *Chemical interference, Acetate, Ammonium ions, Bromide, Iodide, Cyanide, Thiocyanate, Turbidimetry, Mercury ions.

An indirect spectrophotometric method for the determination of small amounts of chloride in fresh waters is described. Chloride ions react with mercury (II) thiocyanate to liberate thiocyanate ions, which can be selectively extracted into nitrobenzene with tris (1,10-phenanthroline) iron (II) chelate cations. The red color (516 nm) of the organic phase measured against a reagent blank is proportional to the initial concentration of chloride ions in the aqueous phase. Beer's law is obeyed over the concentration range of from 0 to the minus 5th power to 5.6 to the minus 5th power M of chloride. The color stability and the apparent sensitivity are better than those of the mercury (II) thiocyanate-iron (III) method. Large amounts of sulphate, phosphate, fluoride, carbonate, acetate, potassium, and ammonium ions had negligible or no effect; bromide, iodide, cyanide, sulphide, and thiocyanate interfered. (McCann-Battelle)
W71-07391

ATOMIC ABSORPTION AND FLUORESCENCE SPECTROSCOPY WITH A CARBON-FILAMENT ATOM RESERVOIR. PART III. A STUDY OF THE DETERMINATION OF CADMIUM BY ATOMIC FLUORESCENCE SPECTROSCOPY WITH AN UNENCLOSED ATOM RESERVOIR,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
J. F. Alder, and T. S. West.
Analytica Chimica Acta, Vol 51, No 3, p 365-372, Sept 1970. 5 fig, 3 tab, 5 ref.

Descriptors: *Spectroscopy, *Fluorescence, Argon, Nitrogen, Instrumentation, Heavy metals, Analytical techniques.
Identifiers: *Cadmium, Atomic fluoresence spectroscopy, Atomic absorption spectroscopy, Chemical interference.

A modified filament atom reservoir cell is described which permits atomic fluorescence measurements to be made without surrounding the electrically heated graphite element with a glass dome. The fluorescence behavior of cadmium in this atom reservoir is given. At 228.8 nm, cadmium exhibits resonance fluorescence more strongly in argon than in nitrogen, but at 326.1 nm cadmium exhibits much strnger 'stepwise fluorescence' in nitrogen than in argon. Nitrous oxide, carbon dioxide, and hydrogen atmospheres show very strong quenching action at 228.8 nm and no luminescence is shown at 326.1 nm. Various interference effects and their elimination are discussed. The detection limits for cadmium are 1.5 to the minus 13th power g (0.00015 p.p.m.) at 228.8 nm in argon and 3 to the minus 13th power g (0.0003 p.p.m.) in nitrogen. (McCann-Battelle)
W71-07392

THE TITRIMETRIC DETERMINATION OF MERCURY (II) WITH THIOACETAMIDE,
Eastman Kodak Co., Rochester, N. Y. Research Labs.
Barbara Coulter, and David G. Bush.
Analytica Chimica Acta, Vol 51, No 3 p 431-436, Sept 1970. 2 fig, 1 tab, 9 ref.

Descriptors: *Volumetric analysis, *Halides, Ions, Organic compounds, Heavy metals.
Identifiers: *Mercury, *Thioacetamide, Schoniger combustion, (Ethylenedinitrilo)-tetraacetic acid (EDTA), Chemical interference.

A rapid method is described for the direct titration of mercury (II) in the presence of halide ions, which cause interference in classical titrations. The mercury (II), in an alkaline solution as the (ethylenedinitrilo) tetraacetic acid (EDTA) complex, is titrated potentiometrically with thioacetamide and a silver sulfide-calomel electrode pair. Organomercury compounds which are not soluble in alkaline EDTA may be titrated after Schoniger combustion. The relative error of the method is 1 percent. (McCann-Battelle)
W71-07393

THE DETERMINATION OF LEAD BY ATOMIC FLUORESCENCE SPECTROSCOPY,
Imperial Coll. of Science and Technology, London (England). Dept. of Chemistry.
R. F. Browner, R. M. Dagnall, and T. S. West.
Analytica Chimica Acta, Vol 50, No 3, p 375-381, June 1970. 1 fig, 3 tab, 13 ref.

Descriptors: *Spectroscopy, *Fluorescence, Aluminum, Argon, Heavy metals, Flame photometry, Analytical techniques.
Identifiers: *Lead, Atomic fluorescence spectroscopy, Signal-noise ratios, Optical system,

Chemical interference, Atomic absorption spectroscopy.

The atomic fluorescence characteristics of lead are described in air-acetylene, nitrous oxide-hydrogen, and argon-oxygen-hydrogen flames. An electrodeless discharge tube is used as the source of excitation. A detection limit of 0.01 microgram/ml of lead in aqueous solution is obtained by measurement of the direct-line fluorescence at 405.8 nm in the argon-oxygen-hydrogen flame. The effect of 100-fold excesses of 30 cations and anions is examined: only aluminum interfered significantly. Effects of multipass optics and signal collection mirrors are examined and their effect on signal-noise ratios is discussed. The study confirmed that lead can be determined more sensitively by atomic fluorescence than by atomic absorption or flame photometry. (McCann-Battelle)
W71-07394

SINGLE COLUMN GAS LIQUID CHROMATOGRAPHY OF METHYL PARATHION AND METABOLITES USING TEMPERATURE PROGRAMMING,
California Univ., Riverside. Dept. of Entomology.
P. S. Jaglan, and F. A. Gunther.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 111-114, Mar/Apr 1970. 2 fig, 6 ref.

Descriptors: *Gas chromatography, *Pesticide residues, *Separation techniques, *Organophosphorus compounds, Water analysis.
Identifiers: *Metabolites, *Methyl parathion, programmed temperature gas chromatography.

Programmed temperature gas chromatography (ptgc) can rapidly separate mixtures of compounds with extremely wide boiling ranges and produce sharp symmetrical peaks that are amenable to qualitative and quantitative interpretation. Using an isothermal operation, dialkyl acid metabolite of methyl parathion could be separated and resolved only with special procedures. However, when six of these compounds were analyzed with ptgc, only methyl paraoxon and desmethylemethyl paraoxon were not resolved. These compounds are not separated because the latter is converted into the former due to column esterification. In evaluating the practicability of the method, it was found that relatively few samples per day could be analyzed with meaningful results because of the time needed for temperature equilibration and the need for duplicate injections to validate results. Other studies have shown that column life may be shortened, and some compounds, such as azinphosmethyl and coumaphos, are decomposed or altered. Quantitative variations as large as 10-20 percent were observed, which could be an important limitation. Nonetheless, the value of ptcg in the qualitative separation of compounds of wide volatilities is evident. (Mortland-Battelle)
W71-07395

COMPARISON OF SEVERAL LIQUID PHASES IN GAS LIQUID CHROMATOGRAPHY OF METHYL PARATHION AND METABOLITES,
California Univ., Riverside. Dept. of Entomology.
P. S. Jaglan, and F. A. Gunther.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 98-103, Mar/Apr 1970. 1 tab, 6 ref.

Descriptors: *Gas chromatography, *Separation techniques, *Organophosphorus compounds, Metabolism, Laboratory equipment.
Identifiers: *Metabolites, *Methyl parathion.

A program is reported to determine organophosphorus compounds by gas liquid chromatography (glc). In this phase of the effort, a comparison is made of the different liquid phases (from 1 to 20 percent coatings) in their ability to separate methyl parathion from its metabolites. Under isothermal conditions, the separation of methyl paraoxon, desmethyl methyl parathion, desmethyl methyl paraoxon, dimethyl phosphorothioic acid, and dimethyl phosphoric acid was not ideal on a single column because the dialkyl compounds eluted very rapidly, while other compounds eluted slowly as rounded or flattened peaks. A glc system is required in which the quantitative separation of low percentage components can be reproducibly accomplished. This can be achieved at low temperatures, but late eluting peaks become broad and unamenable to quantitation. The polar phases were found to be primarily useful for qualitative purposes and the Apiezon L column was found most promising for quantitative purposes. (Mortland-Battelle)
W71-07396

SOURCES OF COMPOUNDS INTERFERING WITH THE ANALYSIS OF EXTRACTS FOR DIELDRIN AND DDT BY GLC,
Massachusetts Univ., East Wareham. Cranberry Experiment Station.
Karl H. Deubert.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 4, p 379-382, July/Aug 1970. 1 tab, 9 ref.

Descriptors: *Water pollution sources, *Insecticides, *Rubber, *Oil, *Runoff, Gas chromatography, Chemical waste, DDT, Dieldrin, Water analysis, Soil analysis, Lubricants, Gasoline, Analytical techniques.
Identifiers: *Polychlorinated biphenyls, Tar, Chemical interference.

Analysis of soil and water by gas liquid chromatography (GLC) is complicated by unidentified peaks in chromatograms. It has been found that polychlorinated biphenyls (PCB's) may be responsible for such peaks in chromatograms of extracts of birds and fishes, and the same may be true for soil and waters. In this study, possible sources of such compounds other than fallout from the chemical industry were considered. Gas chromatography was used to analyze a variety of samples: tire rubber, road tar, synthetic fabric, rubber base board, several lubricants, kerosene, and gasoline. The analyses indicated that there are a variety of sources of compounds that may interfere with quantitation of common chlorinated hydrocarbon insecticides by GLC. Suggested environmental sources of these compounds are: rubber tires or engine oil, road surfaces, and runoff water. (Mortland-Battelle)
W71-07397

EFFECTS OF VARIOUS METALS ON BEHAVIOR OF CONDITIONED GOLDFISH,
California Univ., San Francisco.
Patricia A. Weir, and Charles H. Hine.
Archives Environmental Health, Vol 20, p 45-51, Jan 1970. 4 fig, 4 tab, 14 ref.

Descriptors: *Water pollution effects, *Toxicity, *Fish behavior, *Bioindicators, Sodium arsenate, Psychology, Wastes, Heavy metals, Standards, Water quality.
Identifiers: *Mercury ions, *Selenium ions, *Lead ions, *Sodium ions, *Goldfish, Mercury chloride, Lead nitrate, Selenium dioxide.

The deleterious effects on goldfish of four metal ions at several sublethal concentrations were measured by a conditional avoidance technique. The metals evaluated were chosen since their effect on the central nervous system is known and they are found in aquatic environments as natural and industrial contaminants. The compounds used were: sodium arsenate, lead nitrate, mercuric chloride, and selenium dioxide. The metals were tested in decreasing doses, beginning at 50 percent of their lethal concentrations, until no effects were observed. All of the metals tested impaired performance at concentrations below their lethal level. Mercury was the most potent, producing measurable effects at 0.003 p.p.m. As a result of this study, behavioral toxicity techniques are suggested as useful in setting water quality standards. (Mortland-Battelle)
W71-07398

INFRARED DETERMINATION OF INORGANIC NITRATES BY THE PELLET TECHNIQUE; INFRARED DETERMINATION OF TWO INORGANIC NITRATES IN THE PRESENCE OF EACH OTHER,
Frankford Arsenal, Philadelphia, Pa.
David E. Chasan, and George Norwitz.
Applied Spectroscopy, Vol 24, No 2, p 283-287, 1970. 2 fig, 4 tab, 4 ref.

Descriptors: *Analytical techniques, *Spectrophotometry, *Nitrates, *Inorganic compounds, Potassium compounds, Sodium compounds, Pollutant identification.
Identifiers: *Infrared spectrophotometry, Pellet techniques, Sodium nitrate, Potassium nitrate, Barium nitrate, Strontium nitrate.

The quantitative spectrophotometric determination of inorganic nitrates (sodium, potassium, barium, and strontium) by the pellet technique was investigated. In these methods, the nitrate was weighed into a small tared mortar, 300 mg of potassium bromide was added, the pellet was formed, and absorbances were determined at the appropriate peak. The peaks recommended for sodium, potassium, barium, and strontium nitrates are 836, 825, 730, and 737 (1/cm), respectively. Methods are also proposed for the determination of two nitrates in the presence of each other. For the analysis of a mixture of sodium nitrate and potassium nitrate, measurements were made for sodium nitrate at 836 (1/cm) and for potassium nitrate at 825 (1/cm). For the analysis of a mixture of barium nitrate and strontium nitrate, measurements were made for barium nitrate at 730 (1/cm) and for strontium nitrate at 737 (1/cm). The methods for the determination of two nitrates can be used down to a ratio of 1 to 20. For lesser ratios the errors were rather large. Sulfate did not interfere with any of the procedures. These methods could probably be applied to other combinations of nitrates. (Mortland-Battelle)
W71-07399

A KINETIC METHOD FOR THE DETERMINATION OF FLUORIDE IN THE PARTS-PER-BILLION RANGE,
Freiburg Univ., Freiburg Br., German Federal Republic, Chemical Laboratory.
Dieter Klockow, Heiner Ludwig, and Miguel A. Giraudo.
Analytical Chemistry, Vol 42, No 14, p 1682-1686, Dec 1970. 2 fig, 1 tab.

Descriptors: *Analytical techniques, *Fluoride, *Volumetric analysis, Catalysts, Aqueous solutions, Electrodes.
Identifiers: *Kinetic method, Chemical interference.

Small quantities of fluoride in aqueous solutions can be determined by an indirect kinetic method in which zirconium, acting as a catalyst in the reaction between perborate and iodide, is inhibited by fluoride. In this method, different reaction rates, corresponding to the amounts of fluoride present, are monitored as follows: perborate is present in excess and iodide is added to the mixture by an automatic titrator to the same extent as the reaction proceeds. The rate of addition of the iodide standard solution is a measure for the reaction rate and, consequently, for the concentration of the catalyst (zirconium) or the inhibiting agent (fluoride), respectively. The addition of iodide is controlled by measuring the potential of the iodide/iodine couple. The method has a working range of 19 ng to 190 ng F- per 50 ml or 0.38 to 3.8 p.p.b. The influence of 20 cations and anions on the determination was examined. Several of these caused serious interference, which suggests that they could be determined by the prescribed method. (Mortland-Battelle)
W71-07400

CHARACTERIZATION OF CRUDE AND RESIDUAL-TYPE OILS BY FLUORESENCE SPECTROSCOPY,
Federal Water Pollution Control Administration, Athens, Ga. Southeast Water Lab.
A. D. Thruston, and R. W. Knight.
Environmental Science and Technology, Vol 5, No 1, p 64-69, Jan 1971. 3 fig, 4 tab, 6 ref.

Descriptors: *Spectroscopy, *Oil wastes, Oil, *Fluoresence, Weathering, Sampling, Analytical techniques.
Identifiers: *Fluoresence spectroscopy, *Oil spill, Volatiles, Crude oil, Sunlight, Residual oil.

This method for measuring fluorescence emission intensities of an oil is a rapid and precise method for the comparative identification of crude and semi-refined oils. With samples from an actual oil spill, it was demonstrated that the results of this fluorescence method were in agreement with those of four other oil identification methods. Low-boiling volatiles found in crude oils showed no fluorescing properties in crudes tested, and no analytical problems resulted when volatiles were removed by evaporation before analysis. It should be emphasized that immediate sampling of an oil spill is very important because prolonged exposure to sunlight can affect fluorescence properties of the oil. Also, enough samples should be taken to establish variabilities of parameters within an oil slick. For a comparative identification, it is virtually impossible to tell if oil 'A' is the same as or different from oil 'B' unless a sufficient number of replicate samples of both is obtained. This method might be applicable to other types of oils with use of other fluorescence excitation and emission maxima. (McCann-Battelle)
W71-07402

APPLICATIONS OF ION-EXCHANGE RESINS IN NON-AQUEOUS MEDIA TO THE SEPARATION AND ANALYSIS OF PETROLEUM ADDITIVES,
British Petroleum Co., Ltd., Sunbury-on-Thames (England). Research Centre.
P. V. Webster, J. N. Wilson, and M. C. Franks.
Journal of the Institute of Petroleum, Vol 56, No 547, p 50-56, Jan 1970. 5 fig, 6 tab, 9 ref.

Descriptors: *Ion exchange, *Separation techniques, *Oil wastes, Pollution identification, Resins, Trace elements, Dieldrin, Analytical techniques.
Identifiers: *Oil additive, *Alkylphenols, Biological residues, Pentachlorophenol, Chemical interference.

Non-aqueous ion-exchange procedures were used for the separation and analysis of hindered alkylphenols and aromatic amines. The novel use of cation-exchange resins with transition metal counter-ions for the separation and analysis of additives which form metal complexes is also described. This method possesses the merits of simplicity and versatility, and can avoid the use of costly apparatus. Compared with the classic methods of liquid extraction, the procedures are clean and avoid the difficulties of entrainment and emulsion formation. There is virtually no limit to the size of sample which may be processed in order to recover sufficient material for subsequent analysis. The technique has also been used in the fundamental analysis of petroleum, the separation of trace contaminants, and the analysis of biological residues. It has been incorporated into routine control testing, e.g. in the pesticide field for the determination of dieldrin in the presence of pentachlorophenol. (McCann-Battelle)
W71-07403

CONTINUOUS MONITORING OF AROMATIC COMPOUNDS IN WATER BY DIFFERENTIAL PHOTOMETRY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
Robert S. Saltzman.
Analysis Instrumentation, Vol 6, p 79-85, 1969. 6 fig, 4 ref.

Descriptors: *Industrial wastes, *Phenols, *Photometry, Monitoring, Instrumentation, Hydrogen ion concentration, Automation.
Identifiers: *Ultraviolet absorption, Benzene, Toluene, Xylene, Pyridine.

Monitoring of plant effluents for the presence of aromatic compounds is complicated by the presence of these compounds in the incoming water. However, by continuously monitoring the UV absorption of the influent and effluent, the difference in absorption at the two points provides a measure of the plant contribution to water pollution. The systems in use at E. I. Du Pont in Wilmington, Delaware employ either dual-beam or split-beam analyzers. Where high sensitivity is required, the system incorporates an automatic zero adjustment. For monitoring monocyclic aromatic hydrocarbons, the 254 nm line from a mercury lamp is used as the UV source. However, where polycyclic aromatic, phenol, or pyridine are present, erroneously high analyses may result. But even with this limitation, the concentration of components in the effluent may be constant so that the monitor can be calibrated to measure total concentration. Specific monitoring of low concentrations of phenols can be accomplished by measuring the characteristic wavelength shift of phenol with pH. This method consists of measuring the difference in UV absorption of a sample made highly basic and then made slightly acid. Since only phenol shows this basochromatic shift, the method is highly selective. Schematics of the monitoring systems are shown. (Little-Battelle)
W71-07404

APPLICATION OF THIN-LAYER CHROMATOGRAPHY TO HYDROCARBON-TYPE ANALYSIS,
Shell Oil Co., Deer Park, Tex. Houston Research Lab.
P. V. Peurifoy, M. J. O'Neal, and L. A. Woods.
Journal of Chromatography, Vol 51, No 2, p 227-235, Sept 16, 1970. 7 fig, 4 tab, 7 ref.

Descriptors: *Chromatography, *Oil, *Separation techniques, Resins, Analytical techniques.
Identifiers: Thin layer chromatography, Heavy oil.

Thin-layer chromatography has been applied to the hydrocarbon-type separation of heavy oils, with emphasis on separation of petroleum resins. A three-stage discontinuous layer-gradient plate was employed and found to give better separation of hydrocarbon types than a single absorbent plant. Various solvent combinations were utilized and placed in an eluotropic series as applied to petroleum resin separation. Semiquantitative information was obtained from a completed chromatogram plate by measuring the size of the bands or spots with a ruler or photoelectric scanner. (Little-Battelle)
W71-07405

A NEW RAPID METHOD FOR THE PRODUCTION OF PERMANENT STAINED SLIDES OF MARINE PLANKTON,
Connecticut Coll., New London. Marine Science Program.
Peter A. Lindquist, and Robert De Santo.
Journal of Microscopy, Vol 92, Part 2, p 153-154, Oct 1970. 1 fig, 2 ref.

Descriptors: *Phytoplankton, *Zooplankton, *Analytical techniques, Marking techniques, Membranes, Filters.
Identifiers: Sample preservation.

Preparation time for stained slides of marine plankton has been reduced by filtering plankton samples through a Millipore Hydrosol Stainless filter head adapted to accept a 13 mm, 1.2 micron white filter which is then partially dried and transferred to a blotter floated on a bath of xyene. After the filter becomes transparent, as a result of the xylene, it is transferred to a slide where Turtox stain-mountant is applied. The mountant stains zooplankton whereas the phytoplankton generally remain unstained but identifiable. Total preparation time for the slides is about 15 minutes. (Little-Battelle)
W71-07408

CURRENT WATER QUALITY CONTROL PRACTICES,
H. E. Robbins.
Quality Progress, Vol 111, No 10, p 18-23, Oct 1970. 3 tab, 17 ref.

Descriptors: *Water quality control, *Analytical techniques, *Waste treatment, E. coli, Chemical oxygen demand, Biochemical oxygen demand, Bioindicators, Industrial wastes, Costs, Water reuse.
Identifiers: Specific ion electrodes.

This paper reviews the general effects of water pollution, the sources and types of pollutants, the analytical methods employed and their deficiencies, costs of waste treatment, the industrial usage of water, and the need for further studies to develop improved analytical methods and to determine the ecological effects of wastes. (Little-Battelle)
W71-07409

AUTOMATED COUNTING OF MICROBIAL COLONIES,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering; and Minnesota Univ., Minneapolis. Dept. of Microbiology.
D. J. Schoon, J. F. Drake, A. G. Fredrickson, and H. M. Tsuchiya.
Applied Microbiology, Vol 20, No 5, p 815-820, Nov 1970. 8 fig, 4 tab, 4 ref.

Descriptors: *E. coli, *Automation, *Instrumentation, Lactobacillus, Azotobacter, Electronic equipment, Cultures.
Identifiers: *Counting, *Capillary tube scanner, Coulter counter, Bacillus subtilis, Basillus licheniformis.

The time required for direct counting of colonies on agar plates for estimating population density of viable microorganisms has precluded studies requiring measurement of such a parameter. Bowman, Blume, and Vurek have described a photoelectrical capillary tube scanner which automates the counting. Results obtained with an instrument similar to that of Bowman et al. have been intensively analyzed with respect to precision and accuracy. The sources of 'errors' have been ascertained, and the instrument's potentialities and limitations are discussed. Counts of almost 200,000 capiliary tube readings were made during the course of this study. (McCann-Battelle)
W71-07411

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Burcau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-07412

FURTHER STUDIES ON THE DIFFERENTIATION OF CLOSTRIDIUM SORDELLII FROM CLOSTRIDIUM BIFERMENTANS BY GAS CHROMATOGRAPHY,
National Communicable Disease Center, Atlanta, Ga.
John B. Brooks, V. R. Dowell, D. C. Farshy, and A. Y. Armfield.
Canadian Journal of Microbiology, Vol 16, p 1071-1078, 1970. 3 fig, 3 tab, 13 ref.

Descriptors: *Clostridium, *Cultures, *Gas chromatography, *Pollutant identification, Carbohydrates, Biochemistry.

Identifiers: Clostridium bifermentans, Clostridium sordellii, Gas-liquid chromatography, Urease, Amines, Chloroform.

Amines produced by 31 strains of the Clostridium bifermentans and C. sordelli groups were compared by examining trifluoroaceticanhydride derivatives of basic-chloroform extracts from spent cultural medium by gas-liquid chromatography (g.l.c.) All of the urease-positive strains (16) exhibited an amine profile consistent with that of C. sordellii. On the other hand, 12 of 15 urease-negative strains produced amine g.l.c. patterns like that of C. bifermentans, and three strains produced amine patterns identical with that of C. sordellii. The carbohydrate composition of some of the strains was determined by g.l.c. of trimethylsilyl derivatives of acid-digested formamide extracts of whole cells. Two of the three urease-negative strains with amine profiles like C. sordellii had a carbohydrate composition similar to that of C. sordelli, and the other strain had a carbohydrate profile more like that of C. bifermentans. One known strain of C. bifermentans had a carbohydrate profile with characteristics of both C. bifermentans and C. sordellii. The results of this study point out the variability of urease production by C. sordellii and the value of gas chromatography in differentiating this organism from C. bifermentans. (Mortland-Battelle)
W71-07414

HETEROTROPHIC NUTRITION OF THE MARINE PENNATE DIATOM, CYLINDROTHECA FUSIFORMIS,
Washington Univ., Seattle. Dept. of Oceanography.
Joyce Lewin, and Johan A. Hellebust.
Canadian Journal of Microbiology, Vol 16, p 1123-1129, 1970. 2 fig, 4 tab, 8 ref.

Descriptors: *Diatoms, *Nutrient requirements, *Organic compounds, Littoral, Yeasts, Radioactivity techniques, Pigments, Trophic level, New Jersey, North Carolina, Georgia, Louisiana, Texas, Aquatic microbiology, Cultures.
Identifiers: *Cylindrotheca fusiformis, *Heterotrophic nutrition, Chromatosphore structure.

The capability of Cylindrotheca fusiformis, a marine littoral pennate diatom, for growth by heterotrophic nutrition in darkness was investigated. Lactate, fumarate, melate, Tryptone, Casamino acids, and yeast extract served as organic substrates. Glucose was not successfully used as a substrate. The generation time under optimum conditions in the dark was around 30 hours, compared to 12.5 hours at 2000 lux for cells growing autotrophically in the light. The pigment composition of dark grown cells was similar to that of light-grown cultures, except that diadinoxanthin was not detected in the dark-grown cells. Chromatophore structure in dark-grown cells was normal. Cells brought into the light after three weeks in the dark evolved oxygen immediately upon illumination. Cells did not multiply under anaerobic conditions in the dark but could survive under these conditions for at least two months. Experiments with radioactively labeled organic compounds confirmed the growth experiments. It is not known if Cylindrotheca fusiformis in its natural habitat has the opportunity to make use of the capability for heterotrophic growth. However, five other strains isolated from widely scattered locations demonstrated the same ability. (Mortland-Battelle)
W71-07415

CHARACTERIZATION OF CLOSTRIDIA BY GAS CHROMATOGRAPHY: DIFFERENTIATION OF SPECIES BY TRIMETHYLSILYL DERIVATIVES OF WHOLE-CELL HYDROLYSATES,
National Communicable Disease Center, Atlanta, Ga. Bacteriology Section.
David C. Farshy, and C. W. Moss.
Applied Microbiology, Vol 20, No 1, p 78-84, July 1970. 1 fig, 6 tab, 21 ref.

Descriptors: *Clostridium, *Gas chromatography, *Cultures, *Pollutant identification, Hydrolysis, Biochemistry, Systematics.
Identifiers: Gas-liquid chromatography, Trimethylsilyl.

Trimethylsilyl (TMS) derivatives prepared from whole-cell hydrolysates of 36 strains, representing 10 species of Clostridium were examined by gas-liquid chromatography (GLC). The TMS profile of each species contained a group of peaks which chacterized the species. Variation among strains within a species was much lower than variation between species. Some of the closely related clostridia could be differentiated by comparing their TMS profiles. Strains of Clostridium botulinum were distinguished from C. sporogenes on the basis of the ratio of two GLC peaks which corresponded to arabinose and glucose. A peak with a retention time identical to that of mannose was present in all C. bifermentans strains but was absent in those of C. sordellii. GLC is a useful technique for characterizing microorganisms. It is best used to compare only a few species at a time and is particularly valuable where differentiation of species by conventional biochemical tests is difficult. (Mortland-Battelle)
W71-07416

RETENTION OF MERCURY BY SALMON,
Bureau of Sport Fisheries and Wildlife, Seattle, Wash. Western Fish Disease Lab.
Donald F. Amend.
Progressive Fish-Culturist, Vol 32, No 4, p 192-194, Oct 1970. 1 tab, 4 ref.

Descriptors: *Retention, *Salmon, Sampling, *Pollutant identification, Standards, Fish, *Sockeye salmon.
Identifiers: *Mercury, Muscle tissue, Kidney.

Juvenile sockeye salmon treated repeatedly with mercurials accumulated and retained high levels of mercury in their tissues for several months, but after four years at sea they contained normal levels of mercury in all tissues examined. Adult chinook and coho salmon also treated with mercurials as juveniles did not show abnormal levels of mercury. However, adult salmon exposed to mercury upon returning from the sea, or mercurial-treated juvenile fish, may contain abnormal levels of mercury. The dithizone photometric method (Association of Official Agricultural Chemists, 1965) was used to determine mercury content in fish. (Upadhyaya-Vanderbilt)
W71-07433

TRACE METAL CHARACTERIZATION IN AQUATIC ENVIRONMENTS BY ANODIC STRIPPING VOLTAMMETRY,
Bureau of Commercial Fisheries, Ann Arbor, Mich.
H. E. Allen, W. R. Matson, and K. H. Mancy.
Journal Water Pollution Control Federation, Vol 42, No 4, p 573-581, Apr 1970. 5 fig, 2 tab, 13 ref.

Descriptors: *Heavy metals, *Trace elements, Aquatic environment, *Electrolysis, Chemical analysis, Water pollution sources, *Pollutant identification.
Identifiers: Anoding stripping voltammetry, Electrodesposition.

Anodic stripping voltammetry may be used for quantitative determination of traces of metals in natural water. Less than 0.1 mg/l Pb..2 can be measured in natural waters without preconcentration of the sample. Metals from the sample are electrodeposited on composite mercury-graphite electrodes. Quantitative determination of the deposited metals is made by anodic stripping using a chronoamperometric technique. With short desposition times the kinetics of complexation of metals with naturally occurring complexing agents may be studied. The rates of exchange of complexed metals after the addition of acid or other metal cations also may be determined. (Oleszkiewicz-Vanderbilt)
W71-07445

MORE ON MERCURY,
Michigan Univ., Ann Arbor. Phoenix Memorial Lab.
John D. Jones.
Journal American Water Works Association, Vol 62, No 8, p 526, Aug 1971.

Descriptors: *Analytical techniques, *Neutron activation analysis, *Potable water, Water quality, Heavy metals, *Pollutant identification.
Identifiers: *Mercury.

The author indicates the fact that the previous statement of the Bureau of Water Hygiene, US PHS on the problem of mercury in water supplies (Journal American Water Works Association, Vol 62, No 5, p 285, 1970) completely ignores one of the most sensitive and precise methods of analysis known-the neutron activation analysis. The omission is particularly surprising in view of the fact that much of the analytical work being performed in Canada, where the problem of mercury contamination was first identified, has been done by this method. The author quotes Bernt Sjostrand that the sensitivity limit for biological material is less than 0.5 parts per billion, which is well below that possible with other available methods. In addition, chemical processing is usually greatly simplified, eliminating the possibility of erroneous results due to losses. (Oleszkiewicz-Vanderbilt)
W71-07446

MERCURY IN WATER SUPPLIES.

Journal American Water Works Association, Vol 62, No 5, p 285, May 1970. 3 ref.

Descriptors: *Water quality, *Potable water, *Analytical techniques, Pollutant identification, *Standards.
Identifiers: *Mercury, Dithizone method, Public Health Service Drinking Water Standards Committee.

The Bureau of Water Hygiene of the United States Public Health Service has tentatively proposed a standard of 0.005 ppm for mercury in the drinking water. The rationale for such a low rejection limit stems from the danger to human health from either the acute or chronic ingestion of inorganic and organic mercurials. The limit of 0.005 ppm is considered to contain a reasonable 'safety factor' for the protection of human health in consideration of degree of exposure, routes of entry, metabolic rate, and exertion rate of the heavy metal. The newly-formed Public Health Service Drinking Water Standards Committee is expected to review the tentative standard for mercury as well as any new scientific information which may influence the quantity of mercury allowed in potable water, and to make specific recommendation for the mercury standard. A brief review of analytical methods is given with an indication that the best available method for the determination of mercury is the dithizone method. Practical sensitivity of this technique is reported to be within the limits of 0.001 to 0.01 ppm. (Oleszkiewicz-Vanderbilt)
W71-07448

AN AUTOMATED METHOD FOR MEASURING NANOGRAM QUANTITIES OF ORGANOPHOSPHORUS POISONS,
Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
Thomas L. Hess.
Available from the National Technical Information Service as AD-717 558, $3.00 in paper copy, $0.95 in microfiche. Nov 13, 1970. 13 p, 5 fig, 1 tab, 8 ref.

Descriptors: *Organophosphorus compounds, Colorimetry, Analytical techniques.
Identifiers: *Colorimetric analysis, *Chemical warfare agents, *Toxic agent alarms, *Enzymes, Toxic agent alarms, Microanalysis, Cholinesterase,

Acetylcholinesterase, Nerve agents, V agents, Automatic.

A fast and accurate, automated method was developed for measuring nonogram quantities of organophosphorus compounds. The method employs the use of bovine erythrocyte cholinesterase. The cholinesterase that is not inhibited is reacted with the substrate, acetylthiocholine iodide. The thiocholine released from the enzyme-substrate reaction is reacted with 5,5'-dithio-bis-2-nitrobenzoic acid to produce the color that is analyzed at a wavelength of 420 millimicron on a Technicon AutoAnalyzer.
W71-07456

DETERMINATION OF FLUORIDE POLLUTANTS IN NATURAL WATERS USING A KNOWN-ADDITION TECHNIQUE,
Naval Research Lab., Washington, D.C.
Theodore B. Warner.
Available from the National Technical Information Service as AD-717 595, $3.00 in paper copy, $0.95 in microfiche. NRL Report 7216, Dec 14, 1970. 16 p, 4 tab, 24 ref.

Descriptors: *Fluorides, Halides.
Identifiers: *Water pollution, *Potentiometers, Ions, Aluminum, Iron, Calcium, Magnesium, Errors, Estuaries, Sea water, Reavers.

Fluoride concentrations in complex natural waters, such as estuaries, rivers, or lakes, may be measured using an ion-selective electrode and a known-addition technique in conjunction with a complexing buffer. No additional information, such as interfering ion concentrations or ionic strength, is needed. Reliable measurements may be made in river waters containing as much as 25 mg/l Al3.., 125 mg/l Fe3.., 20 g/l Ca2.., or 2.5 g/l Mg2... Results are accurate to about 0.02 mg F/l. In rivers, the relative standard deviation is 1% to 2% when the fluoride concentration is 1 mg/l and up to 5% when its concentration is 0.1 mg/l. In estuaries, the relative standard deviation ranges between 0.3% and 1.0% under typical conditions.
W71-07457

DEVELOPMENT AND PERFORMANCE OF A MOBILE WATER QUALITY MONITOR,
Raymond W. Raible, and M. K. Testerman.
Advan Instr, Vol 24, Part 3, 1969. 3 fig, 6 ref, 5 p. Presented at the Instrument Society of America 24th Annual Conference, Oct 27-30, 1969.

Descriptors: *Instrumentation, Control systems, *Monitoring, *Pollutant identification, *Data collections.

A mobile water quality monitor intended for extended unattended use in locations where power lines are not available and for survey use is described. All solid state electronics are employed. Field tests have been performed for the past 2 1/2 years. Conclusions and problems concerning the monitors and transducers will be reviewed. Suggestions for future development are given.
W71-07536

PRIME NEED: INSTRUMENTS FOR USE IN FIELD,
Rene J. Bender.
Power, Vol 114, No 10, p 50-53, Oct 1970.

Descriptors: Water pollution control, *Instrumentation, *Monitoring, Administration, Methodology, *Pollutant identification, Measurement.

As demand for pollution control has increased, so has the need for adequate instrumentation. Control of water pollution has reached a standard clearly ahead of air pollution control, and resolves itself into a matter of cost. Water management is becoming increasingly popular; monitoring instruments include pH meters, turbidity indicators, dissolved-solids recorders, DO, BOD, and COD meters, oxidation-reduction-potential sensors, and chloride-ion analyzers. The article contains recent developments in the following areas of methodology and instrumentation: the carbonaceous analyzer, atomic absorption, sewage treatment monitors, telemetry, and flow meters.
W71-07540

MANURE PRODUCTION BY BROILERS,
Maine Univ., Orono. Dept. of Animal Science.
R. W. Gerry.
Poultry Science, Vol 47, p 339-340, 1968. 2 tab, 4 ref.

Descriptors: *Farm wastes, *Poultry, Feeds, Moisture content, Calcium, Phosphorus, Proteins.
Identifiers: *Manure production, Poultry litter, Broilers, Dry droppings, Wood shavings, Crude protein.

A test was conducted in which White Mountain x White Rock cross broiler were reared to 53 days of age and fed a modified New England College Conference starting ration. Actual production of dry matter which did not include the bedding or the moisture in the litter was 867 kilograms per 1000 males, 658 kilograms per 1000 females, and 748 kilograms per 1000 mixed sexes. The average amount of manure (litter) removed at the end of the test period was 1602 kilograms per 1000 birds. This litter included an average of about 500 kilograms of wood shavings per 1000 birds and analyzed 23 percent moisture. During the test period there was a marked increase in crude protein, calcium and phosphorus content of the litter. (White-Iowa State)
W71-07541

BIOCHEMICAL MODEL FOR THE BIOLOGICAL METHYLATION OF MERCURY SUGGESTED FROM METHYLATION STUDIES IN VIVO WITH NEUROSPORA CRASSA,
Swedish Water and Air Pollution Research Lab., Stockholm.
For primary bibliographic entry see Field 05B.
W71-07601

PROBLEMS IN THE DETERMINATION OF SODIUM NITRILOTRIACETATE IN SEWAGE AND EFFLUENT LIQUORS,
Unilever Ltd. (England). Port Sunlight Lab.
G. F. Longman.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 3, p 46, Mar 1971. 1 p.

Descriptors: *Detergents, *Water pollution sources, *Waste water (Pollution), *Sewage, *Nitrogen compounds, Analytical techniques, Heavy metals, Ion exchange, Sodium hydrogen, Pollutant identification.
Identifiers: *Sodium nitrilotriacetate, * (NTA).

The biodegradability of sodium nitrilotriacetate (NTA) in sewage and effluent liquors is studied. Four techniques for determination of NTA were examined. These were coupled with one or more steps aimed at removal of interferences. They were (a) complexometric titration with copper at pH 2.5; (b) formation of copper - NTA complex and determination of this copper with oxine; (c) potentiometric titration with copper by using a copper-ion sensitive electrode; and (d) reaction with the zinc - zincon complex. All four procedures failed to give satisfactory results and the pre-treatments when applied to our systems failed to deal adequately with removal of metals from their NTA chelates. (Woodard-USGS)
W71-07607

A COMPREHENSIVE SAMPLING SYSTEMS FOR STUDYING THE RELATION BETWEEN VISIBILITY, METEOROLOGICAL PARAMETERS AND ATMOSPHERIC POLLUTION,
Atomic Energy Research Establishment, Harwell (England).
A. E. J. Eggleton.
Proceedings of the Society for Analytical Chemistry, Vol 8, No 3, p 44-45, Mar 1971. 2 p.

Descriptors: *Air pollution, *Fog, *Smoke, *Path of pollutants, *Analytical techniques, Sampling, Atmosphere, Environmental sanitation, Ammonium compounds, Instrumentation, Meteorology, Hydrology.
Identifiers: *Environmental pollution, Ammonium sulfate, Visibility.

The northeast coast of England is subject to sea fog, especially in spring and early summer. The situation on Teesside complicated by the presence of pollutants emitted by heavy and chemical industry in the area. A new sensor for visibility measurement (nephelometer) was developed, which measures the amount of light scattered by the atmospheric aerosol when it is illuminated by light from a flash tube. Measurement of temperature, wet-bulb depression, wind speed, wind direction, rainfall and solar radiation were also made by using standard meteorological sensors. When the observations are classified by relative humidity, there is very strong correlation between the reciprocal of the visibility and the ammonium ion concentration, the slope of the regression line being dependent on the relative humidity. Calculation of the theoretical effect of an ammonium sulphate aerosol, based upon the measured particle size distribution, shows about 80 percent of the observed extinction coefficient in the atmosphere can be accounted for. Ammonium sulfate was found widely in the atmosphere. (Woodard-USGS)
W71-07608

SIMULTANEOUS DETERMINATION OF ARSENATE AND PHOSPHATE IN NATURAL WATERS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
David L. Johnson.
Environmental Science and Technology, Vol 5, No 5, p 411-414, May 1971. 4 p, 3 fig, 3 tab, 16 ref. ONR Contract N00014-68-A-0215-0003.

Descriptors: *Chemical analysis, *Water analysis, *Spectrophotometry, *Phosphates, *Arsenic compounds, Analytical techniques, Colorimetry, Instrumentation.
Identifiers: *Arsenates.

Arsenate can be measured in natural waters by a slight modification of normal phosphate methods. Since arsenate, like phosphate, forms a blue complex with molybdate while arsenite does not, the reduction of arsenate to arsenite eliminates its absorbance contribution in phosphate measurements. Thus, under appropriate conditions, the difference in absorbance between a reduced and an unreduced sample can be taken as a measure of the arsenate present. The method requires only one additional reagent. When absorbances are less than 0.3 and analyses are performed at least in triplicate, the method is sensitive to about 0.01 micromole of arsenate per liter; but when the absorbance of the sample is greater than 0.3, the inability to read the spectrophotometer precisely limits the sensitivity to 0.02 to 0.03 micromole per liter. Thus, the method may be used to measure the arsenate concentration in open-ocean water, but with poor precision. It is very convenient for water which has more arsenate than seawater, and in which the ratio of arsenate to phosphate is not too low. (Knapp-USGS)
W71-07617

POTENTIAL APPLICATION OF AN INFRARED SPECTRORADIOMETER FOR REMOTE DETECTION AND IDENTIFICATION OF OIL SLICKS ON WATER,
Gulf General Atomic Co., San Diego, Calif.
James S. Mattson, Harry B. Mark, Jr., Arnold Prostak, and Clarence E. Schutt.
Environmental Science and Technology, Vol 5, No 5, p 415-420, May 1971. 6 p, 10 fig, 1 tab, 3 ref. FWQA Grant No 16020 ELH.

Descriptors: *Remote sensing, *Pollutant identification, *Oily water, *Spectroscopy, Water pollution control, Monitoring.
Identifiers: *Oil spill detection, *Oil spills, Spectroradiometers.

The possibility of a monitoring spectroradiometer for detection and identification of floating oil slicks is demonstrated by simulation experiments on floating organic films. The spectroradiometer has a circular variable interference filter as a monochromator and a small computer for instrument control and preliminary data reduction. For these experiments, a modulated source was used, and the floating organic films used were styrene and oleic acid, compounds which exhibit distinctive spectra in the 8.5 to 12.5 micron range. Characteristic dispersion spectra of these films were obtained successfully, and an actual oil monitoring system can probably be developed. (Knapp-USGS)
W71-07618

NOTE ON REMOVAL OF SULFUR INTERFERENCES FROM SEDIMENT EXTRACTS FOR PESTICIDE ANALYSIS,
Geological Survey, Menlo Park, Calif. Water Resources Div.
D. F. Goerlitz, and L. M. Law.
Bulletin of Environmental Contamination and Toxicology, Vol 6, No 1, p 9-10, 1971. 2 p, 7 ref.

Descriptors: *Sulfur compounds, *Pesticides, *Insecticides, *Bottom sediments, Gas chromatography, Aldrin, Dieldrin, Heptachlor, DDT.
Identifiers: Lindane, Malathion, Methyl parathion, Parathion.

Extracts of bottom muds from lakes, streams, and estuaries are quite often very difficult to analyze for pesticides because of interfering co-extractives. Analysis of the interfering co-extractives by flame-photometric gas chromatography has revealed the presence of a number of sulfur containing compounds. Shaking of a small drop of metallic mercury with the concentrated extract apparently removes sulfur and sulfur-organic compounds by precipitation. Elemental sulfur is removed very rapidly, within 1 or 2 minutes whereas other sulfur compounds react more slowly with the metallic mercury. Preliminary findings indicate that aldrin, dieldrin, heptachlor, lindane, and p,p'-DDT are not affected by the addition or mercury to hexane solutions of the insecticides, even after 5 days in contact with the metal. Malathion, methyl parathion and parathion do react with mercury and removal of these compounds is noticeable after about 10 minutes. Recovery studies are now underway on bottom muds from various locations. (Josefson-USGS)
W71-07621

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.

New York State Department of Environmental Conservation Report, 1970. 390 p, 25 map, 5 append.

Descriptors: *Water quality, *New York, *Data collections, *Sampling, *Monitoring, Water analysis, Water chemistry, Chemical analysis, Solutes, Coliforms, Biochemical oxygen demand, Networks, Dissolved oxygen, Nutrients.
Identifiers: New York Water quality network.

The New York State Water Quality Surveillance Network for the period 1965-1967 consisted of 153 active surface water stations established within 17 principal drainage basins. These sampling stations were selected in an attempt to represent the varying qualities of the waters in each drainage basin. Chemical, bacteriological and physical parameters were routinely measured at the water quality surveillance sampling stations. A basic frequency of one (1) sample per month was arbitrarily established for each sampling point. A major phase of the water quality surveillance program is the storage and retrieval of all water quality data. Availability and use of electronic data processing equipment has been a primary factor in establishing a comprehensive water quality data library. Computer print-out listings of raw or summarized water quality data can be requested. (Knapp-USGS)
W71-07635

PROPYLENE CARBONATE EXTRACTION OF TRIS (PENTAN-2, 4-DIONE)-IRON (III) FROM AQUEOUS SOLUTION: APPLICATION TO THE SPECTROPHOTOMETRIC DETERMINATION OF IRON,
Wofford Coll. Spartanburg, S.C. Dept. of Chemistry.
For primary bibliographic entry see Field 02K.
W71-07641

PESTICIDES IN SOIL,
Wisconsin Univ., Madison. Water Resources Center.
B. E. Frazier, G. Chesters, and G. B. Lee.
Pesticides Monitoring Journal, Vol 4, No 2, p 67-70, Sept 1970. 4 p, 3 fig, 2 tab, 5 ref. OWRR Project B-016-WIS (9).

Descriptors: *Gas chromatography, *Soil contamination, *Pesticide residues, Heptachlor, Aldrin.
Identifiers: Soil samples, Wisconsin, Indigenous soil components, Organochlorine insecticides.

A total of 34 soil samples taken in Wisconsin between 1909 and 1911 were extracted for organochlorine insecticides and analyzed by gas chromatography on 3 columns--a mixed QF-1/IV-17 column; a mixed QF-1/DC-200 column; and a diethylene glycol succinate column. The samples had been stored continuously since collection in tightly sealed glass jars and presumably were free of insecticide contamination. Of the 34 samples 32 showed some 'apparent' insecticide residues on at least one of the columns. Because peaks corresponding to particular organochlorine insecticides on chromatograms from one column did not recur on other columns, it was concluded that the peaks arose from co-extracted indigenous soil components. Peaks corresponding to haptachlor epoxide on the QF-1/OV-17 column and to aldrin on the QF-1/DC-200 column provided greatest interference in chromatographic determination. (Frazier-Wisc)
W71-07676

REMOVAL OF COLOR FROM THE WATER OF WAIKOLOA STREAM SOUTH KOHALA DISTRICT, ISLAND OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
Nathan C. Burbank, Jr., Po Lau Chan, and Reginald H. F. Young.
Technical Report No 38, Mar 1970. 21 p, 10 fig, 1 tab, 5 ref.

Descriptors: *Water analysis, *Color, *Coagulation, *Zeta-potential.
Identifiers: *Organic color, *Color colloids, *Refractive color removal, Cationic polymer.

The waters of the streams in the South Kohala District on the island of Hawaii have long been noted for their extreme high color and at times a distinct peaty taste. Early attempts to treat this water have led to the conclusion that the color bodies occurring in the water were refractive in nature and very difficult to remove except by an uneconomic chemical treatment. Investigation, over a one-year period, has found the colored bodies in the water of the Waikoloa Stream to be predominantly organic in origin with the color colloid having a negative charge. The color of the water varies from a maximum value of 320 units to a minimum value of 22 units. The average value is about 80 units. The zeta potential of the color colloid has varied from negative 36 mv to negative 18.5 mv. It was possible to remove color to the U. S. Public Health Service standards for interstate carriers by coagulating the color bodies with either alum or ferric sulfate. Coagulant aids can significantly reduce the quantity of the coagulant required to effect color removal. Coagulant aids decrease the required retention time in the flocculation basin and effects a faster rate of sedimentation. Further, color removal is generally improved. The most satisfactory coagulant aid is a cationic polymer, which not only acts as an aid but also as a true coagulant in color removal. Reductions by as much as 20 percent in the amount of primary coagulant required is possible while obtaining the same results. The optimum pH range is 6 to 7 and the optimum dosage of cationic polymer is from 1 to 3 mg/l in conjunction with 15 to 20 mg/l of coagulant. (Burbank-Hawaii)
W71-07680

5B. Sources of Pollution

FOOD CHAIN HYPOTHESIS ON THE ORIGIN OF MARINE TOXINS (IN JAPANESE),
Tokyo Univ. (Japan). a. of Marine Biochemistry.
For primary bibliographic entry see Field 05C.
W71-07144

OCCURRENCE AND SIGNIFICANCE OF DDT AND DIELDRIN RESIDUES IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 05C.
W71-07147

STREAM QUALITY MODELING BY QUASILINEARIZATION,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 06A.
W71-07187

FRENCH COASTS. GENERAL REVIEW OF CHEMICAL POLLUTANTS DISPOSED IN THE SEA. LIST OF TOXICITY STUDIES. VOL 1 METHODOLOGY (COTES DE FRANCE, ETUDE GENERALE DES POLLUTIONS CHEMIQUES, REJETEES EN MER. INVENTAIRE ET ETUDES DE TOXICITE, TOME 1, METHODOLOGIE),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, J. Aubert, J. P. Gambarotta, B. Donnier, and M. Barelli.
Revue Internationale D'Oceanographie Medicale, Supplement, Tome 1, 1969. 72 p, 24 fig, 46 ref.

Descriptors: *Water pollution sources, *Pollutants, *Chemical wastes, Detergents, Industrial wastes, Pesticides, Oil, Physicochemical properties, Toxicity, Methodology.
Identifiers: *Coasts of France.

General review of kinds and methodology of chemical pollution along the Mediterranean, Atlantic, English Channel and North Sea Coasts of France. Synthetic detergents, petroleum products, pesticides and industrial wastes were investigated. Physicochemical properties such as temperature, salinity, pH and oxide reduction were measured along with the dosage of the polluting agents. Techniques of cultures, breeding, food chain studies and methods of employing toxic products were tested in vivo. (See also W71-07190) (Ensign-PAI)
W71-07189

FRENCH COASTS. GENERAL REVIEW OF CHEMICAL POLLUTANTS, DISPOSED IN THE SEA. LIST OF TOXICITY STUDIES, VOL II, MEDITERRANEAN SEA (COTES DE FRANCE, ETUDE GENERALE DES POLLUTIONS CHEMIQUES, REJETEES EN MER. INVEN-

TAIRE ET ETUDES DE TOXICITE, TOME II MEDITERANEE),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, J. Aubert, J. P. Gambarotta, B. Donnier, and M. Barelli.
Revue Internationale D'Oceanographie Medicale, Supplement, Tome II, 1969. 135 p.

Descriptors: *Water pollution sources, *Pollutants, *Chemical wastes.
Identifiers: *Charts, *Graphs, *Tables, *Mediterranean.

The toxicity of industrial waste water in the Mediterranean is studied. Results of the techniques for obtaining samples, physicochemical analysis, and biological analysis are presented in charts, graphs and tables. (See also W71-07189) (Ensign-PAI)
W71-07190

HYDROLOGIC IMPLICATIONS OF SOLID-WASTE DISPOSAL,
Geological Survey, Washington, D.C.
William J. Schneider.
Available free on application to the US Geological Survey, Wash, DC 20242. Geological Survey Circular 601-F, 1970. 10 p, 2 fig, 2 tab, 7 ref.

Descriptors: *Solid wastes, *Water resources, *Water pollution, *Waste disposal, Landfills, Incineration, Garbage dumps, Sewage, Sewage effluents, Industrial wastes, Wastes, Domestic wastes, Municipal wastes, Water quality, Hydrologic cycle, Water table.
Identifiers: *Solid waste disposal, Open dumps, Swine feed, Composting, On-site disposal.

Of the six principal methods of solid-waste disposal in general use today, four methods--open dumps, sanitary landfill, incineration, and onsite disposal--carry an inherent potential for pollution of water resources. Seepage of rainwater through the wastes leaches undesirable constituents which reach the groundwater in the area. This leachate is generally both biologically and chemically contaminated. The extent of the pollution from this leachate is largely dependent upon the geologic environment in which the solid wastes are deposited. Pollution potential is highest in permeable areas with a shallow water table where the wastes are in direct contact with the groundwater. In a relatively impermeable area, the pollution is generally confined locally to the vicinity of the waste-disposal site. Regional as well as localized data on the water resources of the area are needed for planning adequate protection to the environment in general and the water resources in particular. (Josefson-USGS)
W71-07238

OCEANOGRAPHIC OBSERVATIONS AND THEORETICAL ANALYSIS OF OIL SLICKS DURING THE CHEVRON SPILL, MARCH 1970,
Louisiana State University, Baton Rouge. Coastal Studies Inst.
S. P. Murray, W. G. Smith, and C. J. Sonu.
Louisiana State University Coastal Studies Institute Technical Report No 87, Sept 30, 1970. 106 p, 34 fig, 6 tab, 37 ref, 2 append. ONR Contract No N00014-69-A-0211-0003. Project No NR 388 002.

Descriptors: *Louisiana, *Oily water, *Path of pollutants, Currents (Water), Winds, Stratified flow, Tidal effects, Tides, Water circulation, Theoretical analysis, Diffusion, Dispersion, Mississippi River.
Identifiers: *Oil spills.

Oceanographic observations were made in a study of the Chevron spilling well off the Mississippi Delta in March, 1970. Surface stress from the wind was most important; at speeds above 15 mph the slick orientation was generally determined by the wind direction. Both calculations and observations showed that tidal currents produced an L-shaped slick geometry when winds were below about 15 mph. The diurnal rotation of the tidal currents served to limit the excursion length of oil from the source, keeping it short of the nearest shore. The presence of fresh water from the Mississippi River in the surface layer and the consequent development of convergence lines often formed a natural barrier, preventing oil from encroaching upon the shore. Theoretical analysis using turbulent diffusion theory predicted that the area and length of a steady-state oil slick increased with oil discharge but decreased with the current speed and the lateral diffusion coefficient. Slick width increased with the rate of discharge and decreased with current speed but was independent of the diffusion coefficient. The width/length ratio of an oil slick, which was notably independent of current speed, was controlled only by the diffusion coefficient and the oil discharge. (Knapp-USGS)
W71-07245

SOURCES OF NITROGEN IN WATER SUPPLIES,
Geological Survey, Denver, Colo.
Marvin C. Goldberg.
In: Role of Agriculture in Clean Water: Iowa State University Press, Chapter 7, p 94-124, 1971. 31 p, 4 fig, 8 tab, 72 ref.

Descriptors: *Nitrogen, *Water pollution sources, *Path of pollutants, *Water chemistry, Farms wastes, Storm runoff, Urbanization, Sewage, Fertilizers, Industrial wastes, Municipal wastes, Soil erosion, Septic tanks, Nitrates, Soil water, Groundwater.
Identifiers: Nitrogen sources (Water pollution).

Sources of nitrogen to water supplies include atmospheric, geologic, biogenic, rural runoff, urban runoff, sewage, irrigation, return flow, animals, sinkholes, caves, feedlots, pollen, rural waste, industrial waste, pond waters, deforestation, and land stripping, among others. Generally, salts of nitrogen applied as fertilizer do not move either vertically or laterally to any significant extent. Nitrate in a nonsalt form seems to have higher soil infiltration capacity than salt nitrogen. This is dependent, however, upon the physical conditions of the soil and the hydrology of the region. In general, industrial waste, rural runoff (including agricultural land and nonagricultural land runoff), farm animal waste, and domestic waste are the dominant sources in surface waters. In groundwater supplies the usual sources of nitrogen are feedlots, privies, septic tanks, or other waste forms. (Knapp-USGS)
W71-07255

RUNOFF, SOLID WASTES, AND NITRATE MOVEMENT ON BEEF FEEDLOTS,
Agricultural Research Service, Lincoln, Nebr.; and Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
C. B. Gilbertson, T. M. McCalla, J. R. Ellis, O. E. Cross, and W. R. Woods.
Journal Water Pollution Control Federation, Vol 43, No 3, Part 1, p 483-493, Mar 1971. 11 p, 2 fig, 6 tab, 18 ref.

Descriptors: *Farm wastes, *Water pollution sources, *Path of pollutants, *Confinement pens, Runoff, Water quality, Nitrates, Groundwater, Surface waters, Water pollution, Industrial wastes.
Identifiers: *Feedlot wastes.

A study of the effect of feedlot slope and cattle densities on the quantity and quality of runoff resulting from rainstorms and snowmelt, the downward movement of pollutants into the soil profile on unpaved feedlots, and the amount of solids accumulation on the feedlot surface revealed that feedlots with 18.58 sq m/head yielded 5.6 metric tons dry matter/day/ha, whereas those with 9.29 sq m/head yielded 7.6 metric tons/day/ha. Feedlot slope had little effect. About 30 percent of the solids were volatile. Runoff quantity and quality depended more on rainfall than slope or cattle density, but high-density lots yielded 130 to 170 percent more winter runoff than low-density lots. Winter runoff averaged 6.2 to 17.6 metric tons/ha-cm, with about 50 percent volatile. Nitrate movement in soil after 1 yr was minimal. (Knapp-USGS)
W71-07258

T1-208 AND Na-24 GAMMA SOURCES FOR IDENTIFYING SOIL WATER TAGGED WITH DEUTERIUM,
Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
For primary bibliographic entry see Field 02G.
W71-07281

DISTRIBUTION OF MERCURY IN UNCONSOLIDATED SEDIMENTS FROM SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
E. Joyce Kennedy, R. R. Ruch, and N. F. Shimp.
Illinois Geological Survey Environmental Geology Notes, No 44, Mar 1971. 18 p, 13 fig, 2 tab, 13 ref.

Descriptors: *Trace elements, *Heavy metals, *Bottom sediments, *Lake Michigan, Data collections, Chemical analysis, Sediments, Radiochemical analysis.
Identifiers: *Mercury.

The mercury content of 132 unconsolidated sediment samples from 31 sampling stations in southern Lake Michigan was determined by a radiochemical separation technique. In the deep central portion of the southern part of the lake and in areas west of Benton Harbor, Michigan, and southwest of Grand Haven, Michigan, mercury had accumulated (0.1 to 0.4 part per million) in the uppermost sediment layers. A base level of 0.03 to 0.06 ppm mercury was found at depth in the cores. In sandy areas along the southern and southwestern shores no accumulation of mercury was apparent near the surface of the sediments; an accumulation at a lower interval in these areas is believed to be associated with the presence of metal sulfides. Mercury concentrations in the sediment-water interface samples evidently vary with the organic carbon and total sulfur concentrations of the samples. (Woodard-USGS)
W71-07286

A NITROGEN GAS DISEASE CATASTROPHE,
Oregon Fish Commission, Clackamas; and Bureau of Commercial Fisheries, Astoria, Oreg.
For primary bibliographic entry see Field 05C.
W71-07342

AN INVESTIGATION OF ELEPHANT SEAL AND SEA LION MORTALITY ON SAN MIGUEL ISLAND,
Naval Undersea Research and Development Center, Point Mugu, Calif. Marine Bioscience Facility.
For primary bibliographic entry see Field 05C.
W71-07344

YEASTS ISOLATED FROM THE SOUTH SASKATCHEWAN, A POLLUTED RIVER,
National Research Council of Canada, Saskatoon, (Saskatchewan). Prairie Regional Lab.
For primary bibliographic entry see Field 05A.
W71-07389

SOURCES OF COMPOUNDS INTERFERING WITH THE ANALYSIS OF EXTRACTS FOR DIELDRIN AND DDT BY GLC,
Massachusetts Univ., East Wareham. Cranberry Experiment Station.
For primary bibliographic entry see Field 05A.
W71-07397

DYNAMICS OF NUTRIENT CONCENTRATIONS IN THE ILLINOIS RIVER,
Illinois State Water Survey, Peoria. Water Quality Section.
For primary bibliographic entry see Field 02H.
W71-07407

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
For primary bibliographic entry see Field 05C.
W71-07412

A COMPREHENSIVE APPRAISAL OF THE EFFECTS OF COOLING WATER DISCHARGE ON AQUATIC ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
Arthur A. Levin, Thomas J. Birch, Robert E. Hillman, and Gilbert E. Raines.
Presented at the Public Affairs Workshop 'Why Nuclear Power', Hilton Head Island, South Carolina, Sept 13-16, 1970. 45 p, 9 fig, 2 tab, 137 ref.

Descriptors: *Power plants, *Thermal pollution, *Reviews, Water temperature, Dissolved oxygen, Bioindicators, E. coli, Aquatic algae, Sunfishes, Snails, Eels, Chinook salmon, Bass, Trout, Minnows, Crayfish, Mosquitoes, Food chain, Herring, Oysters, Clams, Columbia River, California, Washington, Connecticut, Florida, Delaware River, Indiana.
Identifiers: Barnacles, Flounder, Humboldt Bay, Connecticut River, San Joaquin River (California), Biscayne Bay, White River (Indiana), Patuxent River (Canada), Ontario.

A selective review was made of the literature, and based upon the information acquired, a comprehensive appraisal of the effects of cooling water discharge on freshwater and marine ecosystems is made. The aquatic organisms considered include fish, algae, diatoms, enteric bacteria, pathogens, snails, and larvae. (Little-Battelle)
W71-07417

AERIAL SURVEYS OF GREAT LAKES WATER TEMPERATURES, APRIL, 1966 to MARCH, 1968,
Department of Transport, Toronto (Ontario). Meteorological Branch.
T. L. Richards, J. G. Irbe, and D. G. Massey.
Climatological Studies, No 14, p 55, 1969. 93 fig, 11 ref.

Descriptors: *Water temperature, Meteorology, Surface waters, *Isotherms, *Remote sensing, Temperature, Water pollution sources.
Identifiers: *Great Lakes, *Airborne radiation thermometer, Aerial surveys.

This paper describes the instrumentation and technique and publishes the large mass of surface water temperature data collected by 82 Airborne Radiation Thermometers (A.R.T.) in survey flights conducted during two years over the Great Lakes. The temperature data are displayed in the form of analyzed isotherm patterns for each survey and diagrams showing the annual temperature regimes of each lake. Individual surveys and surface water temperature regimes of the lakes as they are related to meteorological factors and the physical characteristics of each lake are discussed. It is concluded that the most evident feature of the surveys is the influence of the depth contour pattern of each lake on the surface water temperature pattern. The relationship between isotherms and depth contour is apparent during both the warming and the cooling seasons. During spring the coldest water invariably remains close to the deep areas with the greatest warming taking place in the shallow nearshore parts of the lake. In autumn the temperature gradient is reversed. (Herrera-Vanderbilt)
W71-07419

BIOLOGICAL METHYLATION OF MERCURY IN AQUATIC ORGANISMS,
Stockholm Univ. (Sweden).
S. Jensen, and A. Jernelov.
Nature, Vol. 223, p 753-754, Aug 16, 1969. 6 ref.

Descriptors: *Path of pollutants, *Heavy metals, Metals, Organic compounds, Carbohydrates, Organic matter, Fish, Water pollution, Water quality, Aquatic animals, Water pollution sources.
Identifiers: Mercury, *Mercury pollution, *Methymercury.

Abnormally large amounts of mercury have been sometimes reported in Swedish fresh water fish. It was shown that the mercury was present almost entirely as methylmercury. Both mono- and dimethyl mercury can be produced in bottom sediments and in rotting fish. The formation of the volatile CH_3HgCH_3 may be a factor in the redistribution of mercury to the environment from aqueous industrial wastes. The tests were performed in an experimental aquarium and results were compared with data obtained from Lake Langsjon. (Novotny-Vanderbilt)
W71-07425

THE ESTUARINE VERSION OF THE COLHEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
D. G. Daniels, J. C. Sonnishsen, and R. T. Jaske.
Battelle Memorial Institute, Atomic Energy Commission Research and Development Report BNWL-1342, UC-70, Richland, Washington, June 1970. 40 p, 25 fig, 7 ref.

Descriptors: *Thermal pollution, *Mathematical models, *Estuaries, *Simulation analysis, Tides, *Temperature, Flow, Flow characteristics, Distribution patterns, Mixing, Thermal powerplants, Water pollution sources.
Identifiers: *COLHEAT digital simulation model.

In order to predict the effects of dam and power plant construction on the temperature in rivers, Battelle's Pacific Northwest Laboratory had developed a river simulation temperature prediction system. The model-COLHEAT river simulation system-has frequently demonstrated its versatility and usefulness. Because many power plants are presently on or planned to be located on estuaries, a simulation model was developed to examine their effects. This model, which is called the estuarine version and is the subject of this report, is a special purpose version of the basic COLHEAT system which allows for volume changes owing to stage variations resulting from tidal action. Homogencity in the vertical direction has been assumed and, therefore, specific treatment of mixing across the halocline has not been included. Reliable river flow, tidal information, and weather records are necessary to utilize the analysis. Application of the model to the lower Columbia River Estuary is shown. (Olcszkiewicz-Vanderbilt)
W71-07428

VANADIUM CONCENTRATIONS IN COLORADO RIVER BASIN WATERS,
Colorado Univ., Boulder. Dept. of Civil Engineering.
K. Daniel Linstedt, and Paul Kruger.
Journal American Water Works Association, Vol 61, No 2, p 85-88, Feb 1969. 2 fig, 3 tab, 4 ref.

Descriptors: *Heavy metals, *Trace elements, Path of pollutants, *Neutron activation analysis, *Colorado River basin, Water pollution sources, Analytical techniques, *Mine wastes.
Identifiers: *Vanadium, Uranium mills.

Vanadium is a trace element in water supplies which is of significance in water quality control research because of its possible physiological effects; for example, it has been shown at low intake levels to act in the inhibition of cholesterol synthesis. The success of the studies on vanadium concentrations in natural waters in the Colorado River basin was based on the specific development of a sensitive neutron activation analysis procedure which allowed for sensitivity of 0.1 micrograms of vanadium. Vanadium concentrations in samples throughout the Colorado River basin varied between 0.2 and 49.2 micrograms/liter over the 15-month period of the study. The lowest amounts of vanadium were found upstream from any industrial activity. Highest concentration values were found at the sampling sites in the vicinity of the uranium-vanadium milling operations. (Oleszkiewicz-Vanderbilt)
W71-07439

TRACE METAL CHARACTERIZATION IN AQUATIC ENVIRONMENTS BY ANODIC STRIPPING VOLTAMMETRY,
Bureau of Commercial Fisheries, Ann Arbor, Mich.
For primary bibliographic entry see Field 05A.
W71-07445

MERCURY-LAMP POLLUTION: HOW MUCH OF A PROBLEM.

Electrical World, Vol 175, No 4, p 100, Feb 15, 1971. 1 tab.

Descriptors: *Landfills, *Heavy metals, Leaching, Waste disposal, Water pollution sources, Public health.
Identifiers: *Mercury consumption, *Mercury-lamp disposal, Sanitary landfill.

Annual mercury consumption in the United States is presented on the basis of date from 1969. Some 26.2% of the total 6,011,828 lbs. of mercury/year is used for electrolytic preparation of chlorine and soda. The second major consumer is the electrical equipment industry (including lamps)-23.5%. The electrical equipment companies are concerned with the possible health hazards and environmental problems connected with the disposal of used lamps, as some 40-50 mg of mercury is used in a single typical 40-w 4 ft. or 75-w 8 ft. flourescent lamp. The Sylvania Electric Products, Inc. spokesman pointed out that proper location of the landfill tract would prevent the mercury from entering waterways. The Sylvania's calculations based on 205.5-million population and 2,000 lbs. of refuse per person per year have indicated that the mercury from lamps would produce a level of about 0.06 ppm when mixed with other refuse. The latter is reported to be close to the natural amount found in soil. (Oleszkiewicz-Vanderbilt)
W71-07449

POLLUTION FROM COMBINED SEWERS: CINCINNATI, OHIO,
Arthur D. Caster, and William J. Stein.
Am Soc Civil Engrs Meeting, Preprint No 1090, 1970. 39 p, 13 fig, 5 tab.

Descriptors: *Sewage, *Storm runoff, *Waste water treatment, Treatment facilities, Ohio.
Identifiers: *Combined sewer overflow, *Cincinnati (Ohio), Mill Creek basin.

The sampling and gaging program was designed to provide basic data to estimate the magnitude of combined sewage pollution in and from the Mill Creek Basin, and by extrapolation, the Cincinnati Service Area. The description of the Service Area, the background hydrological and water quality data, the field investigation program, the analysis of the data, and conclusions are presented herein.
W71-07525

ANIMAL WASTE REUSE--NUTRITIVE VALUE AND POTENTIAL PROBLEMS FROM FEED ADDITIVES--A REVIEW.
Agricultural Research Service, Beltsville, Md. Animal Science Research.
For primary bibliographic entry see Field 05G.
W71-07542

THE MICROBIOLOGY OF BUILT UP POULTRY LITTER,
Edinburgh Univ. (Scotland). Dept. of Bacteriology.
For primary bibliographic entry see Field 05D.

W71-07548

RECYCLING AND UTILIZATION OF BIODEGRADABLE WASTES IN THE SOIL,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05D.
W71-07557

SILVER-108m IN BIOTA AND SEDIMENTS AT BIKINI AND ENIWETOK ATOLLS,
Washington Univ., Seattle. Lab. of Radiation Ecology.
T. M. Beasley, and E. E. Held.
Nature, Vol 230, No 5294, p 450-451, Apr 16, 1971. 2 p, 1 tab, 4 ref.

Descriptors: *Radioactive dating, *Sediments, *Biota, *Pacific Ocean, Nuclear explosions, Fallout, Sampling, Methodology.
Identifiers: *Silver radionuclide (Ag-108m).

The occurrence of the long lived silver radionuclide Ag-108m in biota from the Pacific Ocean suggests that the silver radionuclide ratio Ag-110m/Ag-108m may be useful as a tracer of environmental processes. It also appears that large amounts of Ag-110m and Ag-108m were not produced during the 1958 Nuclear test series or earlier, and that the production activity radio Ag-110m/Ag-108m was 162, a ratio derived solely from the termal neutron activation of stable silver. The radionuclide was first detected in a composite sample of the hepatopancreases of spiny lobsters collected at Bikini Atoll in 1969, and its concentration has since been measured in several samples from Bikini and Eniwetok Atolls. Gamma-ray spectra were made using both NaI (Tl) and a solid state Ge (Li) detector system. Comparison of the concentrations of Ag-108m in the hepatopancreas of spiny lobsters shows that the Bikini specimens contain 2 to 3 times more Ag-108m than those from Eniwetok Atoll. (Woodard-USGS)
W71-07600

BIOCHEMICAL MODEL FOR THE BIOLOGICAL METHYLATION OF MERCURY SUGGESTED FROM METHYLATION STUDIES IN VIVO WITH NEUROSPORA CRASSA,
Swedish Water and Air Pollution Research Lab., Stockholm.
Lars Landner.
Nature, Vol 230, No 5294, p 452-453, Apr 16, 1971. 2 p, 3 tab, 11 ref.

Descriptors: *Water pollution sources, *Heavy metals, *Synthesis, Biochemistry, Biological properties, Chemical properties, Vitamins.
Identifiers: *Mercury, Synthesized methyl mercury.

Since the discovery of methyl mercury formation in lake sediments contaminated with inorganic or phenyl mercury, there has been a good deal of speculation about the mechanism of this synthesis. One process involving methyl-cobalamin (a B12-derivative) was demonstrated in cell-free extracts of methanogenic bacteria. Since vitamin B12 is not known to be involved in the metabolism of Neurospora, the biosynthesis of methyl mercury in this organism, where the pathway should be different, was investigated. The possibility that the methylation of mercury in vivo is achieved by means of a direct transmethylation involving methionine or S-adenosyl-methionine seems less likely on the evidence provided by preliminary experiments with Neurospora (unpublished results of A. Jernelov and L. Landner and personal communication with S. Kitamura). In no case was an increased yield of methyl mercury found when L-methionine was added to the HgC12-containing medium.
W71-07601

PROBLEMS IN THE DETERMINATION OF SODIUM NITRILOTRIACETATE IN SEWAGE AND EFFLUENT LIQUORS,
Unilever Ltd. (England). Port Sunlight Lab.
For primary bibliographic entry see Field 05A.
W71-07607

MICROBIAL DEGRADATION OF THE HERBICIDE ATRAZINE AND ITS 2-HYDROXY ANALOG IN SUBMERGED SOILS,
Hawaii Univ., Honolulu. Dept. of Agronomy and Soil Science.
Kishore P. Goswami, and Richard E. Green.
Environmental Science and Technology, Vol 5, No 5, p 426-429, May 1971. 4 p, 4 fig, 2 tab, 16 ref.

Descriptors: *Biodegradation, *Herbicides, *Aquatic soils, *Bottom sediments, Tracers, Tagging, Path of pollutants, Pesticide kinetics, Carbon radioisotopes, Hydrolysis, Chromatography.
Identifiers: *Atrazine.

Soil-applied pesticides transported by erosion from the site of application to waters and sediments are subject to conditions sufficiently different from those of aerated soils to alter pesticide persistence. Microbial degradation of atrazine and its 2-hydroxy analog (hydroxyatrazine) in submerged soils was studied by measurement of C-14 in evolved C02 and chromatographic separation of metabolites in soil extracts. Chemical hydrolysis of atrazine to hydroxyatrazine is the principal pathway of detoxication in soil and is conductive to ring cleavage and total breakdown by microbes. Biological dealkylation without dehalogination occurs simultaneously. Total breakdown of atrazine should be slower in submerged sediments than in aerated soils because of the higher pH and restricted aeration of sediments. (Knapp-USGS)
W71-07619

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05A.
W71-07635

SOURCE CONTROL OF URBAN WATER POLLUTION,
Florida Univ., Gainesville. Dept of Engineering and American Public Works Association, Chicago, Ill. Technical Services.
For primary bibliographic entry see Field 05G.
W71-07642

MERCURY IN THE ENVIRONMENT,
Duke Univ., Durham, N.C.; and North Carolina Univ., Chapel Hill. School of Public Health.
Leonard J. Goldwater.
Scientific American, Vol 224, No 5, p 15-21, May 1971. 7 p, 7 fig, 1 tab.

Descriptors: *Pollutant identification, *Heavy metals, *Environmental effects, *Water pollution, *Air pollution, Industrial wastes, Soils, Vegetation, Chemical reactions, Fish, Sediments, Reviews, Ecosystems, Foods, Pollutants.
Identifiers: *Mercury, *Mercury pollutants.

Mercury cycle disperses the metal through the lithosphere, hydrosphere and atmosphere and through the biosphere, which interpenetrates all three. Mercury is present in all spheres in trace amounts, but it tends to be concentrated by biological processes. Man's activities, in particular certain industrial processes, may now present a threat by significantly redistributing the metal. Methyl mercury compounds are the most injurious ones. Mercury discharged into water in various forms can be converted by bacteria in detritus and sediments into methyl and dimethyl mercury. Phenyl mercurials, metallic mercury and methoxyethyl mercury are converted into methyls primarily through ionic mercury. Major use of mercury has been as a cathode in the electrolytic preparation of chlorine and caustic soda. In this process a large inventory of mercury is continuously recycled, but in 1968, 23 percent of total mercury demand still went to make up what was wasted. Another 10 percent went for start-up of new plants. Since then legislation and lawsuits have required manufacturers to increase recycling sharply, reducing emissions to the environment. (Woodard-USGS)
W71-07646

ENVIRONMENTAL MERCURY RESEARCH IN SWEDEN,
Swedish Environment Protection Board, Stockholm.
J. E. Larson.
Swedish Environment Protection Board, Stockholm, June 1970. 3 fig, 4 tab, 56 ref.

Descriptors: *Heavy metals, Water pollution, Water pollution effects, Metals, Environmental engineering, Air pollution, Human diseases, Public health, Waste disposal, Human pathology, Animal pathology, Toxicity, Water quality, Industrial wastes, Water pollution sources, *Lethal limit.
Identifiers: *Mercury pollution, Mercury.

The history of the mercury pollution problem is presented, followed by an account of the research which was initiated as a consequence. Decisions of the administrative authorities with regard to allowable concentrations within the mercury field are reported together with the effects of these decisions and measures. The demands for research and corrective measures in order to reduce the deleterious effects as a result of mercury contamination of the environment are described. An economic outline of the research efforts is given in schematic form. Particular attention is paid to the water environment. (Novotny-Vanderbilt)
W71-07664

WATER RESOURCES ACTIVITIES IN THE UNITED STATES-POLLUTION ABATEMENT.
For primary bibliographic entry see Field 06E.
W71-07674

A DISSOLVED OXYGEN PRECICTION MODEL FOR A LONG RIVER,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 05C.
W71-07677

WATER UTILIZATION AND WASTE CONTROL IN THE TEXTILE INDUSTRY,
North Carolina State Univ., Raleigh. School of Textiles.
For primary bibliographic entry see Field 05D.
W71-07679

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

SUMMARY OF INTERIM GUIDELINES FOR DISPOSAL OF SURPLUS OR WASTE PESTICIDES AND PESTICIDIE CONTAINERS.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 147, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides Report DS-1, Wash, DC, Dec 1970. 25 p.

Descriptors: *Pesticides, *Waste disposal, *Insecticides, *Water pollution, Water supply, Land fills, Injection wells.
Identifiers: Incinerators, Hazardous materials, Hydrology, Agricultural wastes, Industrial wastes, *Solid waste disposal, Sanitary landfills.

An interim guideline for surplus or waste pesticides and pesticide container disposal has been drawn

from the combined important points of three Working Group reports, Ground Disposal of Pesticides: The Problem and Criteria for Guidelines; Proceedings of National Working Conference on Pesticide Disposal; and Information Available on Handling Surplus Pesticides, Empty Containers and Emergency Situation. Presented in concise form for ready reference, the subjects of ocean disposal (not recommended), ground disposal and incineration (air disposal) are reviewed. Orientation as to different pesticide users: householders, farm operators, commercial operators, governmental authorities, industrial users, formulators, manufacturers. Ground disposal, its attendant precautions and controls, are discussed as well as methods and disposal site requirements. Incineration technology to date is outlined as the most applicable method of disposal for large amounts of toxic wastes and unusable pesticides. Sections on collection systems as practiced and recommended in various areas including transportation of surplus pesticides and containers, storage considerations with fire and safety precautions, disposal site monitoring and suggested research bring the whole problem into focus. The summary of guidelines provides preliminary guidance with expectation of revision when more definitive solutions are available. Not a set of specific recommendations on disposal.
W71-07699

PROCEEDINGS OF THE NATIONAL WORKING CONFERENCE ON PESTICIDE DISPOSAL, AT NATIONAL AGRICULTURAL LIBRARY, BELSVILLE, MARYLAND, JUNE 30 and JULY 1, 1970.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 145, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides, Report DR-2, Wash, DC, Sept 1970. 139 p.

Descriptors: Landfills, Solid wastes, Water pollution, *Pesticides, *Waste disposal, *Insecticides, *Herbicides, *DDT, Fungicides.
Identifiers: *Incinerators, Hazardous materials, Decontamination, Waste recycling, *2-4-5-T herbicide.

The report is a volume of collected papers delivered before the National Working Conference on Pesticide Disposal by federal, state and industrial officials knowledgeable in various aspects of pesticide disposal; Reports from the Chemical Specialties Manufacturers Association and the National Agricultural Chemicals Association provide industry input; Container size and type, and farmers' use of pesticides and pesticide containers are discussed by the U.S. Department of Agriculture. Reports on Connecticut Florida, Massachusetts, Michigan and Wisconsin are given by officials from these states and programs in the other states are summarized by the National Association of State Departments of Agriculture. Considerations Preliminary to Development of a Waste Pesticide Management System, recall and disposal problems caused by the suspension of 2,4,5-T, Department of Transportation regulations on hazardous materials, Department of Defense disposal program and Air Pollution Problems of Pesticide Disposal are presented by federal and industrial officials. Research on incineration technology, necessary conditions for proper decontamination and combustion of organic pesticides and pesticide containers, and the application of solid waste research to pesticide disposal are reported by university, industry and federal researchers. Information and education programs, and federal coordination are reviewed by federal education and information specialists.
W71-07700

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Washington, D.C.

Available from the National Technical Information Service as PB-197 144, $3.00 in paper copy, $0.95 in microfiche. Working Group on Pesticides Report DR-1, Wash, DC, Mar 1970. 54 p.

Descriptors: Waterwells, Water supply, Injection wells, Landfills, Lagoons, Sewers, Solid wastes, Aquifers, *Pesticides, *Waste disposal, *Insecticides, *Herbicides, *Water pollution, Groundwater.
Identifiers: Pesticides, Agricultural wastes.

A document that states the problem of ground disposal of pesticides, and examines the extent to which contamination occurs in wells and groundwater, discusses the types of pesticide wastes, and considers interactions between pesticides and soils and pesticides and groundwater. It looks into sources of pesticides to be disposed of, describes methods of ground disposal, develops criteria for decision to dispose of pesticide wastes to the subsurface the selection of a disposal zone including a decision matrix, and summarizes disposal site maintenance and monitoring criteria. It concludes with proposed industrial guidelines for pesticide waste disposal. States that the magnitude of contamination threat to groundwater resources from improper ground disposal is dependent upon the physical, chemical, biological and toxicological properties of the pesticidal waste, the hydrogeological characteristics of the disposal site and the volume, state (liquid or solid) and persistence of the waste. The well-developed technology of occurrence and movement of groundwater should be applied to each individual disposal site, to the type of pesticide wastes and to the method under consideration. Nine recommendations on the problem are offered.
W71-07701

5C. Effects of Pollution

EFFECT OF LAGOON EFFLUENT ON A RECEIVING STREAM,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 05D.
W71-07097

EFFECTS OF OXIDATION POND EFFLUENT ON RECEIVING WATER IN THE SAN JOAQUIN RIVER ESTUARY,
Federal Water Quality Administration, Pacific Southwest Region, California/Nevada Basins Office.
For primary bibliographic entry see Field 05D.
W71-07098

ON THE USE OF PHOSPHAMIDON FOR ERADICATION OF FRESH WATER FISH PREDATORS,
Bihar Univ., Muzaffarpur (India). Dept. of Zoology.
U. S. Srivastava, and S. K. Konar.
Summary in German. Experientia, Vol 21, No 390, p 1-3, 1965. 1 tab, 2 ref.

Descriptors: *Pesticide toxicity, *Bioassay, *Fish control agents, *Insect control, Mortality, Fish management, Fish farming, Fish establishment, Carp, Predators, Fish toxins, Lethal limit, Insecticides, Chemcontrol.
Identifiers: *Phosphamidon, *Fish predators, Labeo rohita.

The effectiveness of using the insecticide phosphamidon to control predatory fishes and aquatic predatory insects from fish nursery and rearing ponds, without causing damage to the fish being raised, was determined. Bioassays were conducted to determine the minimum lethal doses of phosphamidon on the test fish and insects. All insect predators were unable to survive even as low a concentration as 10 ppm or lower. Most insect predators can be eradicated from freshwater reservoirs without effecting the fish population, and by employing 100-125 ppm of phosphamidon, most of the predatory fish can also be removed. (Sjolseth-Washington)
W71-07138

LABORATORY STUDIES ON TWO ORGANOPHOSPHOROUS INSECTICIDES, DDVP AND PHOSPHAMIDON, AS SELECTIVE TOXICANTS,
Kalyani Agriculture Univ. (India). Dept of Zoology.
S. K. Konar.
Transactions of the American Fisheries Society, Vol 98, No 3, p 430-437, 1969. 4 tab, 15 ref.

Descriptors: *Bioassay, *Fish food organisms, *Fish control agents, Carp, Toxicity, Organophosphorous pesticides, Fish management, Laboratory tests, Water pollution effects, Aquatic insects, Fish farming, Persistence, Hydrogen ion concentration, Turbidity, Resistance, Phytoplankton, Zooplankton, Eels.
Identifiers: Labeo rohita, *DDVP, *Phosphamidon, *Selective toxicants, Tolerance, Susceptibility, Detoxification.

The cultivated carp, Labeo rohita, showed greater tolerance of both DDVP and phosphamidon than nearly all of twelve undesirable fish species and all of nine predacious aquatic insects tested, so that both of these toxicants exhibited conveniently selective activity. Variations of pH between 5.8 and 8.8, and of turbidity between 125 and 1000 ppm had little or no influence on the toxicity of DDVP. The toxicity of phosphamidon was reduced slightly in acidic water and more markedly in turbid water. Phytoplankters are more resistant to DDVP and to phosphamidon than are zooplankters. The more important food organisms, as well as the predacious insects, are much more susceptible to these insecticides than are the tested fishes. The toxicity of phosphamidon appears to be more persistent than that of DDVP. (Sjolseth-Washington)
W71-07140

PESTICIDES IN HATCHERY TROUT--DIFFERENCES BETWEEN SPECIES AND RESIDUE LEVELS OCCURRING IN COMMERCIAL FISH FOOD,
Pennsylvania State Univ., University Park. Pesticide Research Labs.
For primary bibliographic entry see Field 05A.
W71-07141

CHLORINATED PESTICIDE RESIDUES IN AN AQUATIC ENVIRONMENT LOCATED ADJACENT TO A COMMERCIAL ORCHARD,
Wisconsin Dept. of Agriculture, Madison.
For primary bibliographic entry see Field 05A.
W71-07142

POSSIBLE SELECTIVE MECHANISMS IN THE DEVELOPMENT OF INSECTICIDE-RESISTANT FISH,
Mississippi State Univ., State College. Dept. of Biology.
Mack T. Finley, Denzel E. Ferguson, and J. Larry Ludke.
Pesticides Monitoring Journal, Vol 3, No 4, p 212-218, 1970. 2 fig, 4 tab, 14 ref. USPHS Grants ES 00086 and FD-00134-01.

Descriptors: *Resistance, *Runoff, *Pesticide residues, *DDT, Bioassay, Fishkill, Gas Chromatography, Selectivity, Mississippi, Water pollution sources, Water pollution effects, Pesticide kinetics, Mosquito fish, Sunfishes, On-site investigations, Toxicity, Chlorinated hydrocarbon pesticides.
Identifiers: *Selective mechanisms, *Insecticide-resistant fish, *Toxaphene, DDD, DDE, Susceptibility.

Results of bioassays and gas chromatographic analyses show that populations of insecticide-re-

sistant fish from near heavily treated cotton fields at Belzoni, Miss., are subjected to relatively brief irregular periods of selection after rains. Runoff from cotton fields increased mortality among caged susceptible and native resistant fish. Feeding of endrin-exposed and field-collected resistant mosquitofish (Gambusia affinis) to resistant and susceptible green sunfish (Lepomis cyanellus) showed that selective pressure from residues in the food chain was minimal, compared with direct exposure, provided the consumer was resistant. Live-cage bioassays at top and bottom depths revealed no insecticide stratification in the water. Residue analyses revealed DDT and toxaphene as the two insecticides of selective importance. DDT and toxaphene residues increased in whole fish and water samples after runoff. High DDT values, compared with those of DDD and DDE, suggested recent contamination. (Sjolseth-Washington)
W71-07143

FOOD CHAIN HYPOTHESIS ON THE ORIGIN OF MARINE TOXINS (IN JAPANESE),
Tokyo Univ. (Japan). a. of Marine Biochemistry.
Yoshiro Hashimoto, and Hisao Kamiya.
Bulletin of the Japanese Society of Scientific Fisheries, Vol 36, No 4, p 425-434, 1970. 8 fig, 59 ref.

Descriptors: *Food chains, *Toxins, *Toxicity, *Poisons, *Phytotoxicity, *Path of pollutants, Red tide, Shellfish, Gastropods, Crustaceans, Fish, Carriers, Phytoplankton, Dinoflagellates, Pathology, Ecology, Physiological ecology.
Identifiers: Paralytic shellfish poison, Venerupin, Ciguatera, Saxitoxin, Aluterin, Tetrodotoxin, Detoxification.

The hypotheses on transport of toxins through marine food chains are reviewed. The transfer of saxitoxin (paralytic shellfish poisoning) from dinoflagellates to shellfish is considered to be the only satisfactorily established example. Similarly, ciguatoxin is the only example considered to pass through several trophic levels without modification. Some species apparently contain several toxins concurrently, indicating a complex relationship between food webs and the passage of toxins through them. Passage of poisons through food chains should be proposed only cautiously, as foreign substances are usually metabolized or rapidly excreted by detoxification mechanisms in organisms. More data are required to substantiate the food chain hypothesis. (LeGore-Washington)
W71-07144

EFFECTS OF TEMPERATURE ON SERUM PROTEIN COMPONENTS IN THE KILLIFISH, FUNDULUS HETEROCLITUS,
Cincinnati Univ., Ohio. Dept. of Biological Sciences.
Bruce L. Umminger.
Journal of the Fisheries Research Board of Canada, Vol 27, No 2, p 404-409, 1970. 1 fig, 2 tab, 24 ref.

Descriptors: *Water pollution effects, *Fish physiology, *Electrophoresis, *Acclimatization, Water temperature, Killifishes, Proteins, Laboratory tests.
Identifiers: *Serum protein components, *Fundulus heteroclitus, *Electrophoretic patterns, Temperature effects, Gamma globulins, Beta globulins, Albumins, Alpha globulins, Susceptibility.

Electrophoretic patterns of serum proteins were studied in Fundulus heteroclitus acclimated to temperatures from 30 to -1.5C. Microzone electrophoresis on cellulose acetate revealed eight distinct zones (seven anodal and one cathodal to the origin) at all temperatures. These zones were grouped into three larger zones (I, II and III) for convenience in analysis. Low mobility proteins of zone III decreased in the cold to a greater degree than did high mobility proteins of zones II and I. The greater reduction in these low mobility proteins, which are comparable to human gamma globulins, might produce a less active immune response in cold-acclimated killifish. (Sjolseth-Washington)
W71-07145

EFFECTS OF POLYSTREAM AND DRILLEX ON OYSTER SETTING IN CHESAPEAKE BAY AND CHINCOTEAGUE BAY,
Bureau of Commercial Fisheries, Oxford, Md. Biological Lab.
William N. Shaw, and George T. Griffith.
National Shellfisheries Association 1966 Proceedings, Vol 57, p 17-23, June 1967. 1 fig, 4 tab, 4 ref.

Descriptors: *Oysters, *Evaluation, *Growth rates, *Toxicity, *Chlorinated hydrocarbon pesticides, Commercial shellfish, Spawning, On-site investigations, Antifouling materials, Fouling, Water pollution effects, Pest control, Cultural control, Chemcontrol, Organic compounds, Aquiculture, Chemicals.
Identifiers: *Polychlorinated benzenes, *Benzene, *Polystream, *Drillex, *Oyster setting, *Spawning success, Chesapeake Bay, Chincoteague Bay, Sevin, Cultch, Chlorinated benzenes.

The possibility of increasing the yield of oyster spat, Crassostrea virginica, in Chesapeake and Chincoteague Bays by treating shells with Polystream or with Drillex was tested during 1963. Field studies were also conducted in Watts Bay, Virginia, to determine if the use of Drillex-treated sand in combination with Polystream-treated shells increased oyster setting. Significantly more oysters were caught on both Polystream-treated and on Drillex-treated shells than on untreated shells when they were suspended either in the intertidal zone or placed on the bottom of Chincoteague Bay, and off the bottom in the Tred Avon River. Although in many cases more oysters were caught on chemically-treated shells, Polystream and Drillex apparently did not repel the principal fouling ogranisms in Chincoteague and Chesapeake Bays. In Watts Bay, setting was greater on plots with Polystream-treated shells and with Drillex-treated sand than on either control plots (untreated shells only) or on plots with just Polystream-treated shells. (Sjolseth-Washington)
W71-07146

OCCURRENCE AND SIGNIFICANCE OF DDT AND DIELDRIN RESIDUES IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
Stanton J. Kleinert, Paul E. Degurse, and Thomas L. Wirth.
Wisconsin Department of Natural Resources Technical Bulletin No 41, 1968. 43 p, 2 fig, 3 tab, 49 ref. Wisc Conservation Commission Grant, and US Bureau of Sport Fisheries and Wildlife Funds.

Descriptors: *DDT, *Dieldrin, *Pesticide residues, *Chlorinated hydrocarbon pesticides, Wisconsin, Water pollution effects, Water pollution sources, On-site data collections, Pesticide toxicity, Freshwater fish, Public health, Analytical techniques, Gas chromatography, Pesticide kinetics, Pesticide removal, Fish reproduction, Pest control, Monitoring, Control.
Identifiers: DDD, DDE, Spraying, Recommendations.

Five hundred fifty-five whole fish samples representing 2,673 fish of 35 species were collected from 109 inland lakes and streams of Wisconsin and analyzed for DDT and Dieldrin residues. All of the fish samples contained DDT and 70% contained Dieldrin. DDT levels ranged from 0.222 to 534.6 ppm and averaged 27.15 ppm. Dieldrin levels ranged from 0.026 to 670.2 ppm and averaged 6.15 ppm. These values were expressed relative to the 'fat basis.' Immediate and long-term concerns of the significance of DDT and of Dieldrin residues were discussed. Specific recommendations were listed in an effort to reduce the future threat imposed by the use of persistent pesticides. (Sjolseth-Washington)
W71-07147

THE INFLUENCE OF OXYGEN TENSION ON THE PRESSURE RESISTANCE OF SOME MARINE INVERTEBRATES (In German),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
H. Theede, and A. Ponat.
Marine Biology, Vol 6, No 1, p 66-73, May 1970. 5 fig, 4 tab, 43 ref.

Descriptors: *Resistance, *Hydrostatic pressure, *Invertebrates, *Animal physiology, *Animal metabolism, *Mode of action, Water pollution effects, Mussels, Dissolved oxygen, Laboratory tests, Hydrogen ion concentration, Respiration, Environmental effects, Biochemistry, Enzymes, Inhibition, Oxygen, Oxygenation, Oxygen requirements, Marine animals.
Identifiers: *Oxygen tension, *Pressure resistance, Lactic acid, Cyanide.

Variations in oxygen tension exert a considerable influence on the resistance of invertebrates to high hydrostatic pressure. Pressure resistance of whole animals (Idotea baltica, Cyprina islandica) and of isolated tissues (gill tissues of C. islandica and Mytilus edulis) is higher in a medium not fully air saturated; it decreases with increasing oxygen tension to about air saturation or higher. In some spp. pressure resistance decreases when D.O. is almost absent. Oxygen tension influences pressure resistance not only during exposure to increased pressure, but pressure resistance increases in isolated tissues kept under oxygen deficiency prior to the experiment. Lactic acid, a result of anaerobic glycolysis, increases cellular pressure resistance only if its presence is combined with decreased pH values. Metabolic inhibition with cyanide does not increase pressure resistance. It is suggested that the primary reasons for lowered pressure resistance at saturation or higher oxygen levels are oxidation and inhibition of sensitive thiol enzymes under pressure. Decrease of pressure resistance at extreme degrees of oxygen deficiency may be caused by insufficient rates of ATP synthesis. (Sjolseth-Washington)
W71-07149

EFFECT OF LOW DISSOLVED OXYGEN CONCENTRATIONS ON THE VENTILATION RHYTHM OF THREE TUBICOLOUS CRUSTACEANS, WITH SPECIAL REFERENCE TO THE PHENOMENON OF INTERMITTENT VENTILATION,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
J. C. Gamble.
Marine Biology, Vol 6, No 2, p 121-127, June 1970. 8 fig, 32 ref.

Descriptors: Ventilation, Behavior, *Amphipoda, *Crustaceans, Invertebrates, Animal physiology, *Dissolved oxygen, Respiration, Oxygen requirements.
Identifiers: Pleopods, Peracaridean, Corophium sp., Marinogammarus sp., Tanais sp., Tubicolous crustaceans.

The pleopod ventilatory activity of the tube-dwelling amphipods, Corophium volutator and C. arenarium is intermettent. Unlike the free-living amphipod Marinogammarus obtusatus, which increases its rate of pleopod beating, the pleopod beat rate of both Corophium spp. is unaffected by low oxygen concentrations. However, the nature of the intermittent ventilation rhythm is altered so that, at low D.O., the pleopods of Corophium beat almost continuously. It is suggested that the intermittent ventilation of Corophium can be interpreted as an adaptation to a tubicolus existence. The peracaridean Tanais chevreuxi has 2 independent ventilatory systems, the maxilliped epipodites and the pleopods. The former, which respond to low D.O., are thought to be the principal respiratory organs of T. chevreuxi, while the pleopods, which show no response to low D.O., are believed to be primarily concerned with filter feeding. (Wahtola-Washington)
W71-07150

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
Lewis Orme, Jr.
Proceedings, 14th Annual Arizona Watershed Symposium, Phoenix, Sept 23, 1970, p 27-30, 1971. 3 fig, 1 tab.

Descriptors: *Thermal pollution, *Water Quality Act, *Environmental effects, *Temperature control, *Pollution abatement, Towers, Arid lands, Thermal powerplants, Thermal stress, Arizona, Economic feasibility, Water assimilative capacity, Water quality.

About 95% of all precipitation in Arizona is consumed by evaporation or transpiration. Also, the major river, the Colorado, is high in both salts and silt. However, water pollution is not currently a major problem in the state. Of all the potential pollution problems, the author considers thermal pollution the least understood. The U.S. is the world's highest energy consuming country, and consumption is doubling every ten years. It is estimated that within 20 years, 95% of all power generation will be thermal, and within 30 years, 1/2 - 1/3 of the average daily fresh water runoff in the U.S. will be used to cool electric power stations, raising its temperatures 10-20 deg in the process. In heated waters, oxygen content decreases, which together with higher temperature, decreases the viability of equatic organisms and lowers the capacity of the stream to assimilate other wastes. Fortunately, the Federal Water Quality Act of 1965 set federal-state guidelines for control of thermal pollution and this was subsequently implemented by appropriate legislation in Arizona. Thermal pollution control measures are available, but their use is complicated by economic factors. The best technique, dry closed system towers, is also the most expensive. Rigorous planning is necessary to assure environmental quality in the process of increasing power production. (Casey-Arizona).
W71-07161

TEMPERATURE EFFECTS ON BIOLOGICAL WASTE TREATMENT PROCESSES,
Vanderbilt Univ., Nashville, Tenn.
For primary bibliographic entry see Field 05D.
W71-07321

THERMAL EFFECTS FROM STEAM-ELECTRIC POWER PLANTS,
American Institute of Chemical Engineers, Nuclear Engineering Division.
W. P. Bebbington.
For sale by Superintendent of Documents, US Govt Printing Office, Washington, DC, 20402, Price $3.50. Hearings before the Joint Committee on Atomic Energy, Congress of the United States on Environmental Effects of Producing Electric Power, Part 2, Vol 2, p 2463-2467, Jan 27-30, Feb 24-26, 1970. 1 tab, 2 ref.

Descriptors: *Powerplants, *Thermal pollution, Efficiencies, Safety, Cooling water, Radioactivity, Water pollution effects.
Identifiers: Nuclear, Fossil-fuel, Waste heat.

National average of heat rate and heat to environment of a fossil-fueled, steam-electric generating plant is 10432 and 6848 Btu per kw-hr respectively. Ordinarily about a third of the heat released to the environment by a fossil-fueled plant is by way of the stock and two-thirds by way of the condenser. In the nuclear plant all of the heat released to the environment is by way of the condenser cooling water. Average heat absorbed from the sun by the earth's surface is about 1000 megawatts per square mile. Nuclear power plants emit a slight amount of radioactivity. Fossil-fueled plants emit gaseous products of combustion and fly ash. The choice between nuclear fuel and fossil should be based on local situation such as cost of fuel, population density, water supply, etc. (Upadhyaya-Vanderbilt)
W71-07324

THERMAL EFFECTS OF ELECTRIC POWER PLANTS,
Pacific Gas and Electric Company, Emeryville, California.
James R. Adams.
Proceedings of the Joint Committee on Atomic Energy hearings on Environmental Effects of Producing Electric Power, Feb 24-26, 1970, Wash, DC.

Descriptors: *Thermal pollution, *Thermal power plants, Fish, Temperature, Aquatic life, Biota, California, Estuaries, Marine fish, Ecology, Aquatic habitats, Water pollution, Water quality, Path of pollutants, Pacific Coast Region, Water pollution effects.
Identifiers: Temperature effects.

The effect of thermal power stations on aquatic life and water quality have been extensively studied. Screens and intake structures have been extensively studied. Screens and intake structures have been designed which keep the large fish out of the cooling water system, while smaller fish can actually be passed through the plants without harm. The main effect on other forms of marine life is a dominance of warm tolerant forms in the immediate area of the discharge. Monitoring of water quality around thermal stations does not indicate changes in dissolved oxygen levels or other important parameters. Reasonable predictions of the impact of a thermal power plant on the marine environment can be made by combining ecological studies with a prediction of the thermal regime at that site. Water temperature criteria should be flexible, and each power plant should be examined as a special case. (Novotny-Vanderbilt)
W71-07325

THERMAL POWER, AQUATIC LIFE, AND KILOWATTS ON THE PACIFIC COAST,
Pacific Gas and Electric Company, Emeryville, California.
James R. Adams.
Proceedings of the American Power Conference, Vol 31, 1969.

Descriptors: *Aquatic life, *Thermal pollution, California, Fish, Temperature, Estuaries, Ecology, Marine fish, Water quality, Thermal powerplants, Salmon, Isotherms, Mapping, Aquatic habitats, Coasts, Dissolved oxygen, Pacific Coast Region, Water pollution effects.
Identifiers: Temperature effects.

The paper summarizes some representative studies carried out at thermal power stations in both estuaries and open ocean environments of California. The studies were performed on the thermal tolerance of selected aquatic organisms (fish, oysters). The hazards to a small fish from a trip through the cooling water system were compared to hazards from intake screen impingement by flume temperature experiments and by actual passage through an operating condenser. Salmon passed through the condenser and had no fatalities in 10 separate tests. The use of surface isotherm maps is also discussed. It was also concluded that the temperature increase imposed by the passage of cooling water through operating thermal stations in tidewater does not cause a change in the DO content of the water. Natural temperature fluctuations considerably exceeded the heat loadings imposed by the thermal powerplants. (Novotny-Vanderbilt)
W71-07326

MERCURY IN THE MARINE ENVIRONMENT,
Scripps Institute of Oceanography, La Jolla, Calif.
David H. Klein, and Edward D. Goldberg.
Environmental Science and Technology, Vol 4, No 9, p 765-767, Sept 1970.

Descriptors: *Heavy metals, Water pollution, *Sea water, Metals, Industrial wastes, Marine fish, Marine bacteria, Marine plants, Oceans, Sediments, Organic compounds, Biochemistry, Path of pollutants, Marine animals, Water pollution effects.
Identifiers: Mercury, *Mercury pollution.

Mercury levels in coastal marine organisms are several orders of magnitude greater than in comparable volumes of sea water. Also, higher values of mercury are found in sediments near sewer outfalls as compared to similar deposits further removed from the outfalls. High mercury content in sediments on the east Pacific Ridge may be explained by high organic productivity rather than on the basis of vulcanism or hydrothermal activity. The effects of sewer outfalls on the mercury content of marine sediments were investigated. Near the outfall, the mercury content of the sediments is as much as fiftyfold higher than presumably uncontaminated sediments further away. Industrial and agricultural dispersion of mercury compounds involves organisms by their ingestion of both compounds of this element, and of the element itself. (Novotny-Vanderbilt)
W71-07328

PARAMETRIC STUDY OF POWER PLANT THERMAL POLLUTION,
Newark Coll. of Engineering, N.J.
Amir Nahavandi, and John Campisi.
Journal Water Pollution Control Federation, Vol 43, No 3, p 506-514, Mar 1971.

Descriptors: *Powerplants, *Thermal pollution, *Temperature, *Condenser, Stream, Mathematical models, Water pollution effects, Computer programs.
Identifiers: Parametric study, Power capability factor, Recirculation factor.

The power capability and thermal pollution effect of stream power plants located on rivers or streams were analyzed to determine the power capability for a given downstream temperature. The equations for condenser cooling water were derived and nondimensionalized and a minimum number of dimensionless parameters introduced. By means of a digital computer program, charts were developed that show that power capability and thermal pollution factors (ratio of downstream temperature to condenser temperature, both referred to atmospheric) are direct and inverse linear functions, respectively, of upstream temperature factor (ratio of upstream and condenser discharge temperatures, both referred to atmospheric). Increase in dilution factor improves power capability factor and increases thermal pollution factor; increase in recirculation factor adversely affects power capability factor and decreases thermal pollution factor. (Oleszkiewicz-Vanderbilt)
W71-07329

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W71-07337

MERCURY POLLUTION OF SEA AND FRESH WATER--ITS ACCUMULATION INTO WATER BIOMASS,
Tokyo Univ. (Japan). Dept. of Urban and Sanitary Engineering; and Kobe Univ. (Japan). Dept. of Public Health.
Jun Ui, and Shoji Kitamura.
Contribution to the 4th Colloquium for Medical Oceanography, Oct 2-5, 1969, Naples, Italy. 33 p, 11 fig, 4 tab, 52 ref.

Descriptors: *Public health, *Water pollution effects, *Heavy metals, Water pollution sources, Water pollution control, Mortality, Safety, Chemical wastes, Biomass.
Identifiers: *Mercury pollution, *Methyl mercury, *Minamata disease, Japan, Italy, Holland, Sweden.

The methyl mercury pollution problems in Japan, Sweden and Italy are discussed. Mercury pollution in Japan is tied to Minamata disease, a severe intoxication of the central nervous system of man, caused by ingestion of fish and shellfish containing methyl mercury. The discovery of mercury pollu-

tion in fish and other food in Sweden and its effect on public health and on the environment are discussed. Sources of mercury pollution are listed. A preliminary investigation of mercury pollution is reported from chemical industries in Italy. They observed elevated mercury concentrations in fish near chemical plant waste discharge areas. A case of mercury pollution in Holland is discussed. The need and the present technological ability to stop the discharge of mercury compounds into the environment is stressed. (Sjolseth-Washington)
W71-07338

SOME PROBLEMS IN THE TESTING OF MATERIALS WITH ALGAE,
Central Lab. TNO, Delft (Netherlands).
H. J. Hueck, and D. M. M. Adema.
Summaries in German, English, French and Spanish. Material und Organismen, Vol 2, No 2, p 141-152, 1967. 1 fig, 4 tab, 15 ref.

Descriptors: *Algicides, *Paints, *Test procedures, Antifouling materials, Testing, Biodegradation, Algae, Marine algae, Growth rates, Analytical techniques, Laboratory equipment, Asbestos cement, Chlorella, Carbon dioxide.
Identifiers: *Test development, *Test problems, Hormidium sp.

A few considerations are given about the testing of algicides incorporated in paints and stony materials. Two experimental designs are described: one for testing algicidal paints with aquatic algae, and one for testing algicidal asbestos-cement with aerial algae. For the first purpose a static test is undesirable because of the building up of toxic concentrations in the medium whereas the actual toxicity at the surface of the material should be measured. A device is proposed that uses a continuously innoculated medium flowing slowly through a test aquarium. For the testing of asbestos-cement and other alkaline stony materials with aerial algae it is found that the availability of CO2 near the surface may be a limiting factor. Another device is described to test samples in a flow of air enriched with 5% CO2. (Sjolseth-Washington)
W71-07339

LETHAL EFFECTS OF THE INSECTICIDE DDVP ON THE EGGS AND HATCHLINGS OF THE SNAKE-HEAD, CHANNA PUNCTATUS (BL.) (OPHIOCEPHLIFORMES: OPHIOCEPHALIDAE),
Kalyani Agricultural Univ. (India). Dept. of Zoology.
Sushil Kanta Konar.
Japanese Journal of Ichthyology, Vol 15, No 3, p 130-133, 1969. 1 fig, 1 tab, 15 ref.

Descriptors: *Bioassay, *Viability, *Resistance, *Lethal limit, Toxicity, Mortality, Organophosphorous pesticides, Fish eggs, Hatching, Inhibition, Fish physiology, Juvenile fishes.
Identifiers: *DDVP, *Channa punctatus, *Hatching time, *Hatching success, Hatchlings, Median survival time, Susceptibility.

Laboratory bioassays were made at 66-75 F to determine the effects of the organophosphorous pesticide DDVP on the viability of the snake-head spawn and hatchlings. Sixteen different concentrations ranging from 0.10 to 20.0 ppm were tested against duplicate samples of eggs placed in cylindrical glass jars holding 8 litres of unchlorinated water. The eggs hatched at all test concentrations. Hatching time increased with increased concentration. All eggs hatched at concentrations up to 1.0 ppm within 12 hr. Within the same period, about 60% of the eggs hatched at 1.6 to 16 ppm, and 55% hatched at 20 ppm; the remaining eggs hatched within 24 hr. Yolk sac absorption was normal at 0.10 ppm. The yolk absorption gradually decreased at 1.6 to 4.0 ppm, and totally stopped at 5.0 ppm greater. The hatchlings were many times more sensitive to DDVP than the eggs. The median survival time of hatchlings gradually decreased with the increase of concentration. The eggs and hatchlings survived well at 0.10 ppm DDVP. (Sjolseth-Washington)
W71-07340

NICOTINE AS A FISH POISON,
Kalyani Agricultural Univ. (India). Dept. of Zoology.
S. K. Konar.
The Progressive Fish Culturist, Vol 32, No 2, p 103-104, Apr, 1970. 1 tab.

Descriptors: *Chemcontrol, *Fish control agents, *Carp, *Toxins, Aquatic insects, Fish management, Poisons, Toxicity, Pest control, Pesticides, Pesticide toxicity, Bioassay, Laboratory tests, Fish food organisms.
Identifiers: *Nicotine, *Labeo rohita, *Puntius sophore, *Ranatra filiformis, *Dytiscus sp., Sodium cyanide.

A pesticide that permits rapid and inexpensive live-capture of fish is described. The water soluble plant alkaloid nicotine (1-methyl-2- (3-pyridyl) pyrrolidine) offers some interesting possibilities for this purpose. Quick surfacing and rapid total recovery of the fish removed from the test concentrations were encountered. Recovery time was 2-4 minutes. The aquatic insects tested did not surface at any of the concentrations tested, and were apparently unaffected by the concentrations required to live-capture fish. (Wahtola-Washington)
W71-07341

A NITROGEN GAS DISEASE CATASTROPHE,
Oregon Fish Commission, Clackamas; and Bureau of Commercial Fisheries, Astoria, Oreg.
Ellis J. Wyatt, and Kirk T. Beiningen.
Proceedings of the 20th Annual Northwest Fish Culture Conference, Dec 3-4, 1969, Washington Dept of Game, Olympia, p 71-72.

Descriptors: *Nitrogen, *Fishkill, *Fish passages, *Fish diseases, Pathology, Mortality, Salmon, Gases, Fish handling facilities, Fish hatcheries, Fish management, Fish physiology, Fish toxins, Fish conservation, Water pollution effects, Water pressure, Bioassay, Rainbow trout.
Identifiers: *Chinook salmon, *Gas embolism, *Gas bubble disease.

A severe fish loss is described at the Fish Commission of Oregon's South Santiam Fish Hatchery. Approximately 75-95% of the stock died of gas embolism. Attempts were made to recreate the conditions. Nitrogen gas concentrations were approximated at 175% saturation. Fish died 2 min after first showing signs of abnormal behavior. An LT (100%) (N — 476 fish) occurred at 295 minutes. (Wahtola-Washington)
W71-07342

CATFISH CULTURE IN EFFLUENT WATER,
State Coll. of Arkansas, Conway.
Richard A. Collins.
The Catfish Farmer, Vol 2, No 3, p 7-11, 1970. 7 fig, 1 tab.

Descriptors: *Channel catfish, *Fish farming, *Thermal pollution, *Temperature, Growth rates, On-site investigations, Spawning, Aquiculture, Fish stocking, Catfishes, Thermal water, Texas, Mississippi, Cooling water, Beneficial uses, Mississippi, Texas.
Identifiers: *Cage culture, Feeding cages, Quinaldine.

Channel catfish were cage-reared in Lake Hico, Mississippi and in Lake Colorado City, Texas, which were used as cooling reservoirs by utility companies. Catfish can be reared in the winter in thermal effluents with the same degree of success associated with other lakes in the warmer months. (Wahtola-Washington)
W71-07343

AN INVESTIGATION OF ELEPHANT SEAL AND SEA LION MORTALITY ON SAN MIGUEL ISLAND,
Naval Undersea Research and Development Center, Point Mugu, Calif. Marine Bioscience Facility.
J. G. Simpson, and W. G. Gilmartin.
Bio-science, Vol 20, No 5, p 289, Mar 1, 1970. 2 ref.

Descriptors: *Mortality, *Oily water, *Oil, *Mammals, *Water pollution effects, Toxicity, DDT, Industrial wastes, Ecology, Aquatic animals, Resistance, Pathology, Viruses, Water pollution, On-site investigations, California, On-site data collections, Chromatography, Spectrophotometry.
Identifiers: *Seals, *Sea lions, *Santa Barbara oil spill, *Oil pollution, *Mirounga sp., *Zalophus sp., Crude oil, DDE, Hydrocarbon residues.

Reports of sea lion and elephant seal mortalities caused by the Santa Barbara oil spill were investigated. Several elephant seals with oil on their skin were found, but few appeared ill or distressed. One exception responded well to antibiotics. Autopsy of dead seals and chromatographic and infrared spectrographic tissue analyses failed to indicate hydrocarbon, DDT or DDE residues. Similar tests were made with newly aborted sea lion pups and with one adult sea lion, again with negative results. Serological, histological, bacteriological and virological tests were negative. No correlation existed between the oil spill and the reported mortalities of elephant seals and of sea lions. Supporting references are cited. (LeGore-Washington)
W71-07344

CONTAMINATION OF THE FRESHWATER ECOSYSTEM BY PESTICIDES,
Bureau of Sport Fisheries and Wildlife, Denver, Colo. Fish-Pesticide Research Lab.
Oliver B. Cope.
Summaries in English, French and German. Journal of Applied Ecology, Vol 3 (supplement), p 33-44, Jun 1966. 3 tab, 4 ref.

Descriptors: *Biological communities, *Pesticide residues, *Pesticide removal, *Pesticide drift, *Pesticide kinetics, *Pesticides, *Pesticide toxicity, Ecosystems, Food chains, Water pollution effects, DDT, Chlorinated hydrocarbon pesticides, Fish behavior, 2-4-D, Fish reproduction, Fishkill, Resistance, Growth rates, Fish genetics, Aquatic environment.
Identifiers: *Freshwater ecosystems, *Pesticide pollution, Contamination, Pathologic effects.

The contamination of freshwater ecosystems by pesticides and the subsequent fates of the pesticides are described. The acute effects of pesticides on the flora and fauna are examined, and subacute effects, such as those on behavior, growth, mortality, reproduction, pathology and resistance and genetics, are reviewed. The infinite variety of environmental features of lakes and streams, the multiplicity of chemicals and formulations seen among modern pesticides, and the kinds of effects already noted and measured when pesticides meet plants and animals in freshwater are discussed to emphasize the fact that interactions among these factors can be highly dynamic, productive of manifold effects, and most difficult to predict. (Sjolseth-Washington)
W71-07345

TOXICITY OF ORALLY AND TOPICALLY APPLIED PESTICIDE INGREDIENTS TO CARP, CYPRINUS CARPIO LINNE,
Agricultural Chemicals Inspection Station, Tokyo (Japan); and Institute of Physical and Chemical Research, Tokyo (Japan).
Yasushi Hashimoto, and Jun-ichi Fukami.
Bochu-Kagaku ('Scientific Pest Control'), Vol 34, No 2, p 63-66, 1969. 1 tab, 7 ref.

Descriptors: *Pesticide toxicity, *Mode of action, *Application methods, Pesticides, Carp,

Methodology, Test procedures, Lethal limit, Bioassay, DDT, Chlorinated hydrocarbon pesticides, Organophosphorous pesticides, Herbicides, Fungicides.
Identifiers: *Cyprinus carpio, *Oral application, *Tropical application, Fish gills.

Oral and topical applications of various insecticides, fungicides and herbicides were made on Cyprinus carpio. The LD-50 values for these methods were compared and they were found to differ. In general, the oral application method exhibited lower toxicity than the contact method, especially with fungicides and herbicides. The site of action of various pesticides in fish was discussed based on the listed LD-50 values. Gill parts are thought to be an important site of action or pathway entrance for some pesticides. Further studies are needed to elucidate the modes of action of pesticides on fish. (Sjolseth-Washington)
W71-07346

SHARK PIT ORGANS: RESPONSE TO CHEMICALS,
Hawaii Univ., Honolulu.
Yasuji Katsuki, Keiji Yanagisawa, Albert L. Tester, and James I. Kendall.
Science, Vol 163, p 405-407, 24 Jan 1969. 2 fig, 6 ref.

Descriptors: *Fish physiology, *Fish behavior, *Sodium chloride, *Ions, Sharks, Calcium, Magnesium, Inhibition, Acids, Ammonium salts, Cesium, Discharge measurement.
Identifiers: *Shark pit organ, *Electrophysiology, *Chemical stimulation, *Mechanical stimulation, Nerve fibers, Canal neuromasts, Response, Nurse sharks, Sugar, Quinine, Potassium, Lithium, Histology.

Nerve fibers from pit organs and canal neuromasts are distinguished by the nature of their electrophysiological response to mechanical and chemical stimulation. Pit organs respond to touch but have a relatively high threshold compared with canal neuromasts. They respond readily to sodium and potassium chloride solutions, the rate of discharge increasing with the concentration of the solution. Order of effectiveness with one molar solutions on monovalent cations is as follows: potassium, rubidium greater than sodium, ammonium greater than cesium, lithium. Anions are ineffective. Divalent cations such as calcium and magnesium are inhibitory. Responses to acid, sugar and quinine are either very slight or inhibitory. (Sjolseth-Washington)
W71-07347

GHOST SHRIMP CONTROL EXPERIMENTS WITH SEVIN, 1960-1968,
Washington State Dept. of Fisheries.
R. E. Westley, Herb Tegelberg, Doug Magoon, Clyde S. Sayce, and John S. Chambers.
Washington State Dept of Fisheries Technical Report No 1, Jan 1970. 61 p, 11 fig, 17 tab, 15 ref.

Descriptors: *Commercial shellfish, *Legal aspects, *Pest control, *Chemcontrol, *Carbamate pesticides, Washington, Shrimp, Oysters, Pesticide toxicity, Pesticide residues, Pesticide removal, Regulation, Tidal waters, Mortality, Persistence, Geologic control, Sediment control.
Identifiers: *Sevin, *Ghost shrimp, *Upogebia sp., *Callianassa sp., Grays Harbor Washington.

The report is a compilation of four papers: Sevin (1-napthyl N-methyl carbamate) treatment of a subtidal oyster bed in Grays Harbor, Washington; the uptake of Sevin by Pacific Oysters and bottom muds; observations on potential uptake of Seven by Pacific Oysters; and, investigation of chemical control of ghost shrimp on oyster grounds 1960-1963. With a 10 lb/acre application of Sevin, its uptake by oysters was low and dropped to background levels within four days of application. Sevin residues in bottom mud disappeared by the 16th day. Sevin in concentrations of 10 lb/acre is an effective agent for controlling ghost shrimp. Based on these reports, the Washington State Department of Fisheries promulgated a regulation to maintain strict control of the use of pesticides on oyster grounds. Under a set of restrictions, Sevin is authorized for use in controlling ghost shrimp. (Sjolseth-Washington)
W71-07348

ISOTOPE BIOLOGY OF C-13. EXTENSIVE INCORPORATION OF HIGHLY ENRICHED C-13 IN THE ALGA CHLORELLA VULGARIS,
Argonne National Lab., Ill. Chemistry Div.
E. Flaumenhaft, R. A. Uphaus, and J. J. Katz.
Biochimica et Biophysica Acta, Vol 215, p 421-429, 1970. 3 fig, 1 tab, 26 ref.

Descriptors: *Cytological studies, *Chlorella, *Radioactive isotopes, *Stable isotopes, Plant morphology, Amino acids, Cultures.
Identifiers: Ribonucleic acid, Chlorella vulgaris.

Previously performed work revealed that a replacement in Chlorella vulgaris of ordinary isotopes of hydrogen, carbon, nitrogen, and oxygen by the heavy, stable H-2, C-13, N-15, and O-18 resulted in drastic cytochemical and morphological changes. In this study, C vulgaris has been grown on C-13 (95% C-13) in H-1 and H-2 media. The cytochemical investigations included cell size distribution, carbohydrates, nucleic and amino acids, and proteins. The abnormalities detected in C-12 - H-2 algae diminished in C-13 - H-2 cultures, indicating that a replacement of isotopes in living organisms may radically modify the simple additive relationship. A clear change in cytoplasmic RNA, expressed in cells thread-like accretions, was observed in C-13 - H-2 and in C-13 - H-1 cultures. (Wilde-Wisconsin)
W71-07351

EFFECTS OF ROTENONE ON ZOOPLANKTON COMMUNITIES AND A STUDY OF THEIR RECOVERY PATTERNS IN TWO MOUNTAIN LAKES IN ALBERTA,
Calgary Univ (Alberta). Canadian Wildlife Service.
R. Stewart Anderson.
Journal Fisheries Research Board of Canada, Vol 27, No 8, 1335-1356, 1970. 7 fig, 4 tab, 50 ref.

Descriptors: *Insecticides, *Rotenone, *Toxicity, *Zooplankton, *Water pollution effects, Biological communities, Fish, Lakes, Mortality, Crustaceans, Succession, Phytoplankton, Rotifers, Resistance, Environmental effects, Diatoms, Larvae, Copepods, Snails.
Identifiers: *Recovery patterns, Side effects, Cladocerans, Jasper National Park (Canada), Community stability, Daphnia galeata mendotae, Gammarus lacustris, Cyclops vernalis, Kellicottia longispina, Keratella cochlearis, Leeches.

Investigation of long-term effects of rotenone on zooplankton communities was undertaken in conjunction with a fisheries management project using rotenone to eradicate undesirable fish. Devastation and recovery of zooplankton communities were studied in relation to application of rotenone to two mountain lakes in Jasper National Park (Canada). Crustacean plankters were absent for about six months after treatment, but rotifers and net phytoplankton were never completely eradicated. All crustacean species, with one exception, reached prerotenone abundance in about three years, probably the minimum time for recovery in these lakes. Recovery is likely related to fecundity, time of reproduction, and the presence of resistant stages. Diaptomus sicilis had not reached reproductive maturity when rotenone was applied, and was the last species to recover to its original numbers. Some species not found in samples before application were found in small numbers afterwards, probably partly due to movement from littoral into limnetic zone. Blooms of small cladocerans after treatment were soon supplanted by increases in large cladoceran numbers. Most variations in composition and abundance after rotenone were likely due to changes in competition and predation pressures rather than to changes in environmental factors or direct effects of rotenone. (Jones-Wisconsin)
W71-07353

A COMPARATIVE STUDY OF CELL THERMOSTABILITY OF MOLLUSKS FROM THE WHITE SEA IN RELATION TO THE VERTICAL DISTRIBUTION OF SPECIES AND THE HISTORY OF FAUNA DEVELOPMENT, (IN RUSSIAN),
Akademiya Nauk SSSR, Vladivostok. Laboratoriya Fiziolozicheskoi Zkolozii.
A. V. Zhirmunskii.
Zhurnal Obshchei Biologii, Vol 30, No 6, p 686-703, 1969. 3 fig, 2 tab, 104 ref.

Descriptors: *Mollusks, *Cytological studies, *Temperature, Biological membranes, Resistance, Ecological distribution, Reproduction, Genetics, Spawning animals.
Identifiers: *Thermostability, *White Sea, *Vertical distribution, Kandalaksha Bay, Boreal species, Arctic species.

This study was concerned with thermostability of oscillating epithelial cells of 12 mollusk species inhabiting the White Sea. A correlation was established between the level of thermostability, vertical distribution of the species, the critical limits of temperature, and the average temperature of spawning. The physiology of organisms reflects the properties acquired by their ancestors in their original habitats. The cell thermostability of arctic species is considerably lower than that of boreal species. (Wilde-Wisconsin)
W71-07355

ON METHANE OXIDIZING BACTERIA IN FRESH WATERS. I. INTRODUCTION TO THE PROBLEM AND INVESTIGATIONS ON THE PRESENCE OF OBLIGATE METHANE OXIDIZERS,
Max-Planck-Institut fuer Limnologiezu Ploen (West Germany).
M. Naguib, and J. Overbeck.
Zeitschrift fur Allegemeine Mikrobiologie, Vol 10, No 1, p 17-36, 1970. 19 fig, 2 tab, 52 ref.

Descriptors: *Methane bacteria, *Methane, *Bacteria, *Absorption, Anaerobic bacteria, Oxygen, Carbon, Eutrophication, Lakes, Test procedures, Gas chromatography, Oxidation.
Identifiers: *Obligate methane oxidizers, Heterotrophs, Prototrophs, Pink organisms, Methane oxidation, Lake Pluss (West Germany).

Bacterial cultures of presumably methane-oxidizers were obtained from water samples collected from different layers of eutrophic Pluss Lake in Schleswig-Holstein (West Germany). The dynamics of gases was investigated by gas chromatographic analyses. Pure culture of the dominant forms were isolated by means of a micro-manipulator. Incubation of isolated bacteria with methane as the only source of carbon failed to demonstrate the uptake of methane; the organisms proved to be heterotrophs subsiding on conventional organic substrata. No obligate methane oxidizers, such as Pseudomonas methanica, Methylococcus, and Methanomonas methanooxidans, were present in the investigated lake. The authors disagree with claims of prototrophic growth of bacteria with methane as the only source of energy. (Wilde-Wisconsin)
W71-07356

THE GROWTH RATE VARIABILITY OF CHLORELLA VULGARIS BEIJER. CLONES GROWTH AFTER MUTAGEN TREATMENT UNDER AUTOTROPHIC OR HETEROTROPHIC CONDITIONS ON THE SURFACE OF A SOLID MEDIUM,
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
J. Necas.

Biologia Plantarum (Praha), Vol 12, No 5, p 359-367, 1970. 6 fig, 9 ref.

Descriptors: *Chlorella, *Cytological studies, *Light, *Growth rates, Populations, Ultraviolet radiation.
Identifiers: Chemical mutagens, Chlorella vulgaris, Clones.

The cells of mutation-predisposed Chlorella vulgaris, strain Cesnokov 'V' clones, were treated with chemical mutagens: N-ethyl-N-nitrosourea and hydroxylamine hydrochloride. The cells were then transferred to solid media of different nutrient contents and the rate of growth recorded at 28-30C. The investigated Cesnokov's strain exhibited superior variability, particularly on media free from deficiencies. Changes of light conditions for the purpose of inducing reparation of the mutagen damaged cells failed to influence clonal populations. (Wilde-Wisconsin)
W71-07357

PHOTOSYNTHETIC COEFFICIENT AS A FUNCTION OF THE COMPOSITION OF PLANT BIOMASS, (IN RUSSIAN),
Institut Mediko-Biologicheskikh Problem, Moscow (USSR).
V. V. Begrov.
English summary. Zhurnal Obshchei Biologii, Vol 31, No 1, p 99-105, 1970. 9 ref.

Descriptors: *Photosynthesis, *Numerical analysis, *Plants, Analytical techniques, Mathematical models, Metabolism, Biomass, Chlorella.
Identifiers: *Formulae, *Photosynthetic coefficient, Potato, Chlorella pyrenoidosa.

Formulae are included for calculation of the photosynthetic coefficient of plants. The components of sums and their ratios include elemental and biochemical properties of plant tissues, such as biomass, content of assimilated carbon dioxide, water consumption per unit of dry matter, emanation of oxygen, content of nutrient elements, etc. An example illustrates variation of the photosynthetic coefficient under the influence of assimilated nitrogen. The coefficients are calculated for potato and Chlorella pyrenoidosa. A relationship was established between the current, integral, and average values of the coefficient. (Wilde-Wisconsin)
W71-07359

NOTES ON FRESHWATER ALGAE, (IN GERMAN),
Vienna Univ, (Austria), Botanisches Institut und Botanischer Garten.
Lothar Geitler.
Osterreichische Botanische Zeitschrift, No 118, p 306-310, 1970. 16 ref.

Descriptors: *Algae, *Fresh water, Distribution patterns, Behavior.
Identifiers: Mougeotia genuflexa, Ankistrodesmus falcatus, Podohedra.

This paper describes distribution and behavior of freshwater algae, including Mougeotia genuflexa, Ankistrodesmus falcatus, var stipitatus, and members of the genus Podohedra. (Wilde-Wisconsin)
W71-07360

PHOTO-FILM INDUSTRY WASTES: POLLUTION EFFECTS AND ABATEMENT,
Central Public Health Engineering Research Inst., Nagpur (India).
For primary bibliographic entry see Field 05D.
W71-07366

EFFECTS OF ALKYLBENZENE SULFONATES ON YEASTS,
Georgia State Univ., Atlanta. Center for Disease Control.
For primary bibliographic entry see Field 05A.
W71-07387

EFFECTS OF VARIOUS METALS ON BEHAVIOR OF CONDITIONED GOLDFISH,
California Univ., San Francisco.
For primary bibliographic entry see Field 05A.
W71-07398

CHROMOSOME BREAKAGE IN HUMANS EXPOSED TO METHYL MERCURY THROUGH FISH CONSUMPTION,
National Inst. of Public Health, Stockholm (Sweden).
Staffan Skerfving, Kerstin Hansson, and Jan Lindsten.
Archives Environmental Health, Vol 21, p 133-139, Aug 1970. 2 fig, 2 tab, 37 ref.

Descriptors: *Water pollution effects, *Chromosomes, Pollutents, Toxins, Animal physiology, Heavy metals, Fish, Toxicity.
Identifiers: *Mercury, Lymphocyte, Chromosome breaks, Phenyl mercury, Methoxyethyl mercury, Alkyl mercury compounds.

Several alkyl mercury compounds, phenyl mercury, and methoxyethyl mercury have been shown to induce chromosome abnormalities in different organisms. Preliminary study shows an increased frequency of chromosome breaks in cells from lymphocyte cultures from nine subjects known to have increased blood levels of mercury. The subjects had eaten contaminated fish at least three times a week for more than five years. Mercury levels in these fish ranged from 1 to 7 p.p.m. Three subjects had not consumed contaminated fish for 5 to 18 months; the others were still exposed. Four healthy subjects were studied as controls. Mercury level in red blood cells was measured for all subjects. The exposed subjects had levels about 2 to 40 times higher than unexposed subjects. There was no statistically significant difference in the frequency of chromosome breaks between the control and the exposed group. However, there was a significant correlation between the frequency of cells with breaks and mercury concentration. The biological significance of these findings is not known. (Mortland-Battelle)
W71-07410

A POLYCHLORINATED BIPHENYL (AROCLOR 1254) IN THE WATER, SEDIMENT, AND BIOTA OF ESCAMBIA BAY, FLORIDA,
Bureau of Commercial Fisheries, Gulf Breeze, Fla. Center for Estuarine and Menhaden Research.
T. W. Duke, J. I. Lowe, and A. J. Wilson, Jr.
Bulletin of Environmental Contamination and Toxicology, Vol 5, No 2, p 171-180, Mar-Apr 1970. 2 fig, 3 tab, 7 ref.

Descriptors: *Water pollution effects, *Bioassay, *Toxicity, *Chlorinated hydrocarbons, *Bioindicators, Industrial wastes, Florida, Sessile algae, Estuaries, Chemical wastes, Gas chromatography, Sediments, Oysters, Shrimp, Crabs, Water pollution sources, Sea water, Trout, Toxins.
Identifiers: *Polychlorinated biphenyls, Aroclor 1254, Escambia River, Pinfish, Flounder, Croaker, Menhaden.

Aroclor 1254, a polychlorinated biphenyl, has been detected in the biota, sediment, and water of estuarine areas near Pensacola, Florida. Only one source of the chemical, an industrial plant on the Escambia River, has been found. Water, sediment, and fish, crab, oyster, and shrimp samples were collected from April through October 1969 and analyzed using gas chromatography procedures. In addition, bioassays on fish, shrimp, and oysters were conducted under controlled laboratory conditions to determine the toxic effects of Aroclor 1254. These studies showed that juvenile shrimp were the most sensitive and were killed when exposed to 5.0 ppb of Aroclor 1254 in flowing sea water. The Aroclor content in water from Escambia Bay, even near the mouth of the river, was less than 1 ppb. Shrimp collected from the bay contained a maximum of 2.5 p.p.m. Thus, shrimp in the bay probably were not exposed to lethal levels during the sampling period. Highest concentrations in the water occurred during August and decreased when leakage from the plant was corrected. (Mortland-Battelle)
W71-07412

POLYCHLORINATED BIPHENYL: INTERACTION WITH DUCK HEPATITUS VIRUS,
Wisconsin Univ., Madison. Dept. of Veterinary Science.
Milton Friend, and Daniel O. Trainer.
Science, Vol 170, No 3964, p 1314-1316, Dec 18, 1970. 1 fig, 2 tab, 8 ref.

Descriptors: *Mallard duck, DDT, Mortality, Viruses, Toxicity.
Identifiers: *Polychlorinated biphenyl, *Hepatitis virus, Aroclor 1254.

As part of an investigation of possible interactions between organochlorine pollutants and infectious diseases, this study was initiated to determine whether any interaction, antagonistic or synergistic, occurs with PCB and duck hepatitis virus (DHV) in mallards. Ten-day-old mallard ducklings fed a polychlorinated biphenyl at concentrations of 25, 50, and 100 parts per million for 10 days suffered no apparent clinical intoxication. Five days later these birds were challenged with duck hepatitis virus, and they suffered significantly higher mortality than birds which were not exposed to the polychlorinated biphenyl. The study illustrates one of the potential effects of sublethal concentrations of chemical pollutants. (McCann-Battelle)
W71-07413

HETEROTROPHIC NUTRITION OF THE MARINE PENNATE DIATOM, CYLINDROTHECA FUSIFORMIS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 05A.
W71-07415

A COMPREHENSIVE APPRAISAL OF THE EFFECTS OF COOLING WATER DISCHARGE ON AQUATIC ECOSYSTEMS,
Battelle Memorial Inst., Columbus, Ohio. Columbus Labs.
For primary bibliographic entry see Field 05B.
W71-07417

THERMAL DISCHARGE FROM NUCLEAR PLANTS AND RELATED WEATHER MODIFICATION,
State Univ. of New York, Albany. Atmospheric Sciences Research Center.
Ronald Stewart.
Proceedings of Twelfth Conference on Great Lakes Research, University of Michigan, p 488-491, May 5-7. 2 tab, 6 ref.

Descriptors: *Thermal pollution, *Nuclear powerplants, Temperature, Humidity, Fog, *Weather modification, *Benificial use, Water pollution effects.
Identifiers: Thermal discharge.

The volume of thermal discharge from power plants is increasing at a rate which suggests that the discharge will cause inadvertent weather modification. A 1000 MW nuclear powerplant uses approximately one million gallons per minute of which 10,000 gallons evaporate. This is sufficient to reduce visibility and increase fogging in the area under suitable atmospheric conditions. Beneficial uses of thermal discharge are suggested and calculations are presented to indicate that waste heat released by a dry closed circuit coding system is sufficient to dissipate fog and increase visibility. (Upadhyaya-Vanderbilt)
W71-07418

THERMAL INVESTIGATIONS IN CALIFORNIA,
Pacific Gas and Electric Co., Emeryville, Calif.

James R. Adams.
Marine Pollution Bulletin, Vol 1 (NS), No 9, p 140-142, Sept 1970.

Descriptors: *Thermal pollution, *California, *Estuaries, Temperature, Ecology, Thermal powerplants, Mapping, Isotherms, Fish, Aquatic life, Water quality, Aquatic habitats, Pacific Coast Region, Tidal powerplants, Water pollution effects.
Identifiers: *Thermal tolerance.

In California 22 power stations with a total capacity of 16,824 MW discharge into tidal areas. Research into thermal tolerance of fish and other aquatic organisms to cooling water was conducted in order to provide necessary information for evaluation of ecological impact. The investigations made in several locations (San Francisco Bay Delta, Monterey Bay) are described and a summary of results discussed. The prediction of ecological impact for one location (Diablo Nuclear Plant), was verified and it was found that the marine community had definitely responded to the discharge but had returned to an essentially normal complement of warm water and cold water forms within 230 m of the discharge. (Novotny-Vanderbilt)
W71-07420

MERCURY: NO NEED FOR HYSTERIA.

Life, Vol 70, No 3, p 32-33, Jan 29, 1971.

Descriptors: *Metals, *Aquatic life, *Food chains, Limiting factors, Water pollution effects.
Identifiers: *Mercury pollution, *Mercury poisoning, Methylmercury, Tuna, Swordfish.

This article is aimed at describing, in broad terms, the mercury pollution problem, its origin, pathways of mercury, potential hazard to human beings and necessary, as well as unnecessary, precautions. Swordfish and tuna may have high amounts of mercury because they are both wide ranging predators, at the top of long food chains. In the body of water containing 0.00001 ppm of mercury, the fish might contain 10 ppm. Symptoms and a brief history of mercury poisoning is given. The Food and Drug Administration limit of 0.5 ppm maximum permissible concentration in food is quoted, however, the Food and Drug Administration cannot state that all mercury residue in fish below this guideline is safe, as well as that all mercury above 0.5 ppm is unsafe. (Oleszkiewicz-Vanderbilt)
W71-07422

IMPACT OF WASTE HEAT ON AQUATIC ECOLOGY,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
Clarence A. Carlson.
Proceedings of the Symposium, 'Our Generation and Environmental Changes', American Association of Advancement Sciences Meeting, 1969. 9 p, 10 ref.

Descriptors: *Temperature effects, *Thermal pollution, *Ecology, *Thermal powerplants, Cooling water, *Aquatic population, Temperature, Streams, Water pollution effects.

The impact of increasing electric power production connected with increasing discharges of waste heat in streams from the standpoint of ecology and water quality represents a serious problem. The temperature is important to aquatic organisms as a lethal, directive, and controlling factor. Five major effects of heat pollution on higher aquatic organisms are listed. The importance of water quality and temperature standards are listed. The importance of water quality and temperature standards ought to be stressed. In addition to standards, there is a great need for more research on the response of various aquatic organisms to temperature. Several possible means to control water temperature (cooling tower, etc.) are discussed. (Novotny-Vanderbilt)
W71-07424

ECOLOGICAL IMPACT OF NUCLEAR-FUELED POWER PLANTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
Clarence A. Carlson.
In: Extension Series, Cornell University, Ithaca, New York, Department of Natural Resources, (1970). 33 ref.

Descriptors: *Temperature effects, *Thermal pollution, Ecology, *Nuclear powerplants, *Cooling water, Radioactive wastes, Fish, Aquatic population, Temperature, Streams, Lakes, Estuaries, Water pollution effects.

Nuclear powerplants require water for cooling their condensers and such plants have a capacity to discharge water that is warmer and more radioactive than the entering water. The discharged heat may be harmful to aquatic organisms. Five major effects of heat pollution are listed in this paper. Proper thermal standards should be developed. The biological effects of radiation are classified as somatic and genetic effects. The radionuclide concentration in aquatic and marine organisms is discussed. The major weakness of radiological standards is that they are designed to protect humans but not to protect aquatic life. Information on responses of aquatic organisms to radiation seems to be inadequate, more research work is necessary. (Novotny-Vanderbilt)
W71-07426

THERMAL POLLUTION-A CAUSE FOR CONCERN,
Virginia Polytechnic Inst., Blacksburg. Coll. of Arts and Sciences.
John Cairns, Jr.
Journal Water Pollution Control Federation, Vol 43, No 1, p 55-66, Jan 1971. 18 ref.

Descriptors: *Thermal pollution, *Environmental effects, *Ecosystems, Electric power industry, Conservation, Thermal stress, Heat, Speciation, Acclimatization, Biota, Water pollution effects.
Identifiers: Thermal tolerance.

The paper is a general discussion of thermal pollution. Its causes, its relationship to the water balance of this nation, and its effects on organisms in lakes, rivers, streams, and estuaries are reviewed. Technological advances cause stresses on the natural environment. Organisms are limited in their responses to changes. Nontolerant species are excluded, and resistent species replace them. Illustrations of the effects of thermal pollution are presented. The concept that this planet's ability to support life and its ability to transform wastes into acceptable or useful materials is discussed. Developing a balanced life-support system that serves the greatest variety of beneficial uses will not be possible unless man abandons narrow discipline-oriented, single-purpose views toward environmental management and use. (OleszKiewicz-Vanderbilt)
W71-07427

THE CANADIAN APPROACH TO ACCEPTABLE DAILY INTAKES OF MERCURY IN FOODS,
Department of National Health and Welfare, Ottawa (Ontario).
A. B. Morrison.
Meeting Paper, Symposium on 'Mercury and Man's Environment', Feb 15 and 16, 1971. Royal Society of Canada, Ottawa.

Descriptors: *Heavy metals, *Human pathology, *Foods, Toxicity, Fish, Environmental engineering, Water pollution effects, Diseases, Epidemiology, Lethal limit, Public health, Animal pathology.
Identifiers: *Mercury, *Mercury pollution, Acceptable daily intakes.

Studies and results on acceptable daily intakes are presented. Acceptable daily intake is obtained by applying a 10-fold safety factor for inter-species variations, and a further 10-fold safety factor for intra-species variations. The acceptable daily intake for man is thus 1/100 of the no-effect level in the most sensitive animal species tested. From the knowledge of the acceptable daily intake, the maximum permissible level (M.P.L.) is obtained. In Canada the limit of 0.5 ppm of mercury in fish on a wet weight basis was adopted and a guideline proposed. The allowable intakes rates are discussed. The lowest whole-blood concentration of mercury associated with toxic symptoms (0.2 mcg/gram) was considered to represent a daily intake of 0.3 mg of methylmercury for 70-kg man. From this computation, it was concluded that the margin of safety in fish contamination as a food for man is very low. But, the program has shown that mercury levels in the total human diet are extremely low. (Novotny-Vanderbilt)
W71-07441

MERCURY IN THE ENVIRONMENT: NATURAL AND HUMAN FACTORS,
Allen L. Hammond.
Science, Vol 171, No 3973, p 788-789, Feb 26, 1971.

Descriptors: *Fish, *Environment, *Toxicity, Standards, Water pollution effects.
Identifiers: *Mercury, Concentration, Health effects.

Metallic mercury and inorganic mercury usually attack the liver and kidney and have a short half-life whereas methyl mercury and other alkyl mercury compounds attack the central nervous system and have a half-life of about 70 days. Symptoms of methyl mercury poisoning in man may include loss of vision, hearing, coordination, and intellectual ability. The lowest concentration in the blood which is reported to cause identifiable symptoms is 0.2 ppm. The oceans contain approximately 1.3 x 10 to the 18th power metric ton of water with average concentration of mercury close to 0.1 ppb. This amounts to 10 to the 8th power metric tons of mercury whereas total mercury from man's activities amounts to less than 10 to the 4th power metric tons per year. Methylation seems to proceed more efficiently in aerobic systems than in anaerobic systems. (Upadhyaya-Vanderbilt)
W71-07442

AQUATIC ECOSYSTEMS AND THERMAL POWER PLANTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
Loren D. Jensen, and Derek K. Brady.
Journal of the Power Division, Proceedings of American Society of Civil Engineers, Vol 97, No PO1, Proc Paper 7802, p 209-217, Jan 1971.

Descriptors: *Thermal pollution, *Cooling water, *Thermal powerplants, Water pollution effects, *Sites.
Identifiers: *Aquatic ecosystems, *Thermobiology, Temperature criteria, Biological zones.

The factors which affect biological responses to temperature changes in aquatic ecosystems are discussed in terms of their influence on siting, design and operation of thermal power plants. Recommended are: (1) the development of a basis for classifying aquatic organisms according to their relative importance in maintaining the balance of specific ecosystems; (2) the biological zoning of receiving waters, with time-dependent temperature criteria based on the annual reproduction cycles of ecologically important species; (3) the development of criteria which incorporate the effects of temperature rise, duration of exposure, rate of change, and frequency of violation; (4) the field investigation of planktonic entrainment in cooling water intakes to evaluate the effects of temperature, turbulence and recirculation; (5) a flexible approach to the design of cooling water systems so as to facilitate subsequent modifications and additions; and (6) the incorporation into plant operational procedures of careful control of rates of load change. (Oleszkiewicz-Vanderbilt)
W71-07452

HEXAVALENT CHROMIUM: TOXICOLOGICAL EFFECTS AND MEANS FOR REMOVAL FROM AQUEOUS SOLUTION,
Naval Research Lab., Washington, D.C.
C. M. Shepherd, and R. L. Jones.
Available from the National Technical Information Service as AD-717 348, $3.00 in paper copy, $0.95 in microfiche. NRL Report 7215, Jan 4, 1971. 20 p, 67 ref.

Descriptors: *Chromium, *Water pollution effects.
Identifiers: *Chromium compounds, *Toxicity, *Chromates, Plants, Botany, Animals, Ecology, Wastes, Industrial, Reviews, Removal, Navy, Ion exchange, *Water treatment, *Chemical removal, Water treatment, *Water pollution control, Industrial waste treatment.

There has been concern recently of the possibility of long-term disturbances of our environmental ecology by hexavalent chromium discharged in industrial and, in some cases, naval waste waters. To aid in the assessment of these potential dangers, the literature was surveyed to provide a perspective overview of the toxicities of hexavalent chromium toward plant and animal. The means available for reducing chromate concentrations in waste waters to ppm levels were reviewed for suitability for Navy usage. The techniques considered were chemical reduction, with subsequent precipitation of the trivalent chromium product; ion exchange; direct precipitation; ion flotation; electrochemical reduction; and electrodialysis. Background and orientational information are furnished for use in considering Navy chromate pollution problems and their rectification.
W71-07454

THE EFFECTS OF URBAN DRAINAGE ON LAKE McILWAINE, RHODESIA,
J. McKendrick, and R. K. Williams.
Water Pollution Control, Vol 68, p 523-528, 1969.

Descriptors: *Water quality, Water treatment, Effluents, Investigations, Water pollution sources.
Identifiers: *Rhodesia, *Urban runoff, Algal growth, *Lake McIlwaine.

From 1953 to 1959 there was little change in the quality of the water in lake McIlwaine, which is the main source of supply for Salisbury, Rhodesia, but from 1960 trouble began to be experienced with heavy algal growths which interfered with treatment of the water. When the lake water intake level was lowered to avoid the algae, problems were caused by manganese and iron in the lower waters of the lake. Studies on conditions in the lake showed that the algal growths were caused by high concentrations of phosphate and nitrogen brought into the lake by the rivers to which the effluents from the city's sewage works and oxidation lagoons were discharged; algal growths were most severe during periods of low rainfall when less dilution was available.
W71-07524

DRINKING OF SULFATE-WATER BY CATTLE,
Nevada Univ., Reno.
H. J. Weeth, and J. E. Hunter.
Journal Paper No 168. Journal of Animal Science, Vol 32, No 2, p 277-281, 1971. 1 tab, 39 ref. West Reg Research Project W-46.

Descriptors: *Sulfates, *Sodium chloride, Farm wastes, Cattle, Toxicity, Water, Growth rates, Water pollution effects.
Identifiers: *Drinking water, Sulfate water, Hemoglobin.

This study was designed to characterize some of the effects on cattle of drinking water contaminated with a known concentration of sulfate. Nine growing Hereford heifers were offered as drinking water either tap-water, 5,000 ppm Na sub 2 SO sub 4-water or 4,110 ppm NaCl-water. The experimental design was a 3x3 latin square with replicates. Experimental periods were 30 days. Total urine was collected on the last 7 days with renal clearance observations being made on the sixth day. The season was summer. The heifers drank less, ate less and lost weight while consuming the sulfate-water. The sulfate ion caused a relative diuresis. Percent urine water of free-water intake was 33.8 with sulfate-water, but only 22.1% with tap water. Total hemoglobin concentration was unaffected by the saline drinking waters, however, the sulfate-water caused a 450% increase in methemoglobin concentration and the development of 416.9 mg/100 ml of sulfhemoglobin. The two nonfunctional hemoglobins comprise 6.2% of total hemoglobin at this time. Drinking the sulfate-water increased serum sulfate concentration 63.1%, increased renal filtration of sulfate 45.2%, but decreased renal reabsorption of sulfate by 27.5%. Drinking sulfate-water did not alter plasma calcium concentration or renal excretion of calcium. A specific toxic effect of drinking the Na sub 2 SO sub 4-water was not apparent, however, the adverse effects seen were related to the sulfate ion. Only a slight polyposia and diuresis were observed with drinking of the NaCl-water. (Christenbury-Iowa State)
W71-07555

WATER CONFLICTS ON LAKE ERIE,
Pennsylvania Dept. of Health, Harrisburg, Pa.
Walter Lyon.
In: Great Lakes Water Resources Conference, Toronto, Hydro-Electric Power Commission of Toronto, p 115-120, 1968.

Descriptors: *Water quality, *Management, *Pollution, *Lake Erie, *Regional analysis, Fisheries, Recreation, Population, Lakes, Streams, Mathematical studies, Costs, Social aspects, Industrial wastes.
Identifiers: *Economic objectives, *Regional economy, *Pollution abatement, Trapped segments, Public policy.

Attempts are made to clarify the facts about the condition of Lake Erie in order to offset the adverse economic effect of reports that Lake Erie is 'dead' and a polluted health hazard. Lake Erie is 'sick' rather than 'dead', having suffered serious injury because many of its uses have been abused by economic objectives which failed to relate the regional economy to the protection of the lake as a natural resource. Some of the lake's problems which are specified include the ecological imbalance of overfertilization by phosphates, the change in the species composition of fish, and the accumulation of residual pollutants from treated sewage and industrial waste discharges. Three steps are proposed to improve the water quality of the lake, namely implementation of the pollution abatement program, improvement of fisheries, and development of a conceptual policy framework based on a model of the lake which considers ecologic, hydrologic, and biochemical and other subsystems operative in the lake and which would relate pollution abatement to resultant water quality and use improvements. (See also W71-07565) (Murphy-Rutgers)
W71-07569

MERCURY IN THE ENVIRONMENT,
Duke Univ., Durham, N.C.; and North Carolina Univ., Chapel Hill. School of Public Health.
For primary bibliographic entry see Field 05B.
W71-07646

THERMAL EFFECTS STUDIES BY NUCLEAR POWER PLANT LICENSEES AND APPLICANTS.
Atomic Energy Commission, New York.

For sale by the Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $3.50. Hearing before the Joint Committee on Atomic Energy, Congress of the United States, on Environmental Effects of Producing Electric Power, Part 2, Vol 2, p 2233-2315, Jan 27-30, Feb 24-26, 1970.

Descriptors: *Thermal pollution, *Nuclear powerplants, Costs, Condensers, Sites, Temperature, Nuclear reactors, Water pollution effects.
Identifiers: Cooling source, Environmental research.

During 1969, the Atomic Energy Commission Director of Regulation conducted a survey of Atomic Energy Commission nuclear powerplant licensees and studies they had undertaken or planned concerning effects of the discharge of heated condenser cooling water from their plants on aquatic environments. This report consists of brief summaries of the information furnished by 43 respondents. The survey showed that a variety of measures are being taken by many utilities to minimize potential thermal effects of their plants and meet state water quality standards. These methods include cooling towers, cooling ponds, subsurface discharge devices, multiport diffusers, deep water intakes, canals several miles long, and large capacity pumps to increase flow rate during the summer. (Upadhyaya-Vanderbilt)
W71-07665

ENVIRONMENTAL EFFECTS OF CONDENSER WATER DISCHARGE IN SOUTHWEST LAKE MICHIGAN,
BIO-TEST Labs., Inc., Northbrook, Ill.
Lawrence P. Beer.
Proceedings of Twelfth Conference on Great Lakes Research, Michigan University, Ann Arbor, Michigan, p 504-512, May 5-7, 1969. 3 fig, 8 tab, 2 ref.

Descriptors: *Thermal pollution, *Lake Michigan, *Temperature, Dissolved oxygen, Isotherms, *Cooling water, Sport fish, Plankton, Stratification, Water pollution effects, Great Lakes.
Identifiers: Heat dissipation.

A study of heat dissipation rates and patterns, bottom and lake organisms, and chemistry of lake waters was made at the outfall of Commonwealth Edison Company's Waukegan generating station. Heat input from the 760,000 gpm flow with a condenser water rise of 12F, is dissipated 3200 ft. offshore. At only 1500 ft. offshore, heat is dissipated to within 2-3F of ambient. Condenser water mixes with lake water in shallow depths near shore and floats on the surface of deeper cooler water. Dissolved oxygen remained unchanged in the offshore area at near saturation levels of 11.0 to 11.5 mg per liter. Benthic or bottom-living organisms vital to the food chain of commercial and sport fish have not been eliminated by discharge from the station. Plankton counts do not indicate any definite effect from the heated discharge. Sport fish, including trout and coho salmon which frequent the water near the discharge, have not apparently suffered any deleterious effect. The study took place in three days in April. (Upadhyaya-Vanderbilt)
W71-07667

POLLUTION OF LAKE ERIE, LAKE ONTARIO AND THE INTERNATIONAL SECTION OF THE ST. LAWRENCE RIVER.
Technical Advisory Board on Air Pollution, International Joint Commission (Canada).

Report by the International Joint Commission Canada and United States, 1970. 174 p, 5 fig, 4 tab.

Descriptors: *Water pollution sources, *Water pollution effects, *Pollutants, *Monitoring, *Legal aspects, Lake Erie, Lake Ontario, St. Lawrence River.
Identifiers: *Potential, Remedial measures, Proposed objectives.

The International Joint Commission reports on an inquiry into the pollution of Lake Erie, Lake Ontario and the International Section of the St. Lawrence River. The locations, causes and extent of pollution were studied. Recommendations for water quality objectives were made in the hopes

that both Canada and the United States would adopt them and enter into agreement on programs and measures to achieve those objectives. Authority by the Commission to monitor the water quality and abatement progress was recommended. The IJC also recommended that the reference of October 1964 be extended to authorize pollution studies in the remaining boundary waters of the Great Lakes and tributary waters. (Ensign-PAI)
W71-07671

A DISSOLVED OXYGEN PRECICTION MODEL FOR A LONG RIVER,
Wisconsin Univ., Madison. Water Resources Center.
Charles H. Falkner.
Technical Report. Preliminary, 1969. 29 p, 12 fig, 21 ref. OWRR Contract C-1228.

Descriptors: *Dissolved oxygen, *River systems, *Biodegradation, Municipal wastes, Industrial wastes, Flow, Temperature.
Identifiers: Deoxygenation, Reoxygenation, Models.

A model was presented for predicting the effects of the deoxygenation-reoxygenation process in a long complex river system resulting from the discharge of biodegradation wastes by municipalities and industries. The model estimated the dissolved oxygen (DO) profile as a function of flow and temperature. The variational effects of flow, temperature and other river parameters were approximated by step functions. The river was divided into subreaches. The approach was essentially a steady state approximation of a dynamic system. The problems and results of applying the model to a 180-mile reach of the Wisconsin River were presented. (Thiuri-Cornell)
W71-07677

INSECTICIDES AND THE GREAT LAKES,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Great Lakes Fishery Lab.
Robert E. Reinert.
Limnos Magazine, (Great Lakes Foundation), Vol 2, No 3, p 4-9, 1969. 2 fig.

Descriptors: *DDT, Chlorinated hydrocarbon pesticides, *Pesticide residues, Pesticide toxicity, *Great Lakes, Lake Michigan, *Public health, Gas chromatography, Pesticide removal, *Analytical techniques, Dieldrin, Water pollution effects, Fisheries.
Identifiers: *Coho salmon, Long-term effects, *DDT bodily distribution.

A brief history of the DDT problem in the Great Lakes is presented. The analysis of coho salmon for insecticides is described, as is the DDT distribution in Lake Michigan coho. Abdominal adipose tissue contained 92.33 ppm DDT, belly fat 69.66 ppm, dorsal median fat 62.82 ppm, lateral line fat 34.31 ppm, and flesh 5.66 ppm. The possible implications of the DDT laden fish on human health are discussed. (Sjolseth-Washington)
W71-07690

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

EXISTING AND POTENTIAL PROBLEMS OF EXCESSIVE EUTROPHICATION IN THE TENNESSEE VALLEY,
Tennessee Valley Authority, Chattanooga. Water Quality Branch.
Eugene B. Welch.
Proceedings of the 7th Annual Sanitary and Water Resources Engineering Conference, Vanderbilt University, Nashville, Tennessee, p 45-73, 1968. 7 fig, 8 ref.

Descriptors: *Eutrophication, *Tennessee Valley Authority Project, *Reservoirs, Temperature, Dissolved oxygen, Density, Rooted aquatic plants, Algae, Chlorophyll, Hypolimnion, Phosphorus, Nitrogen, Phytoplankton, Productivity, Turbidity, Surfaces, Depth, Distribution, Time, Epilimnion, Thermocline, Light penetration, Standing crop, Industrial wastes, Rainfall, Alabama.
Identifiers: Cherokee Reservoir (Tenn), Holston River (Tenn), Potomogeton pectinatus, Potomogeton crispus, Heteramthera, Pickwick Reservoir (Tenn), Najas, Photic zone, Douglas Reservoir (Tenn), Norris Reservoir (Tenn), French Broad River (Tenn), Chickamauga Reservoir (Tenn), Florence (Ala).

Pattern of hypolimnetic oxygen depletion in three TVA system reservoirs appears related to phytoplankton productivity, which is affected by several environmental factors. In reservoirs studied, nutrient (nitrogen and phosphorus) content potential limits production only during intense summer stratification. Thermal stratification affecting nutrient distribution and light availability, turbidity affecting light penetration, and water detention time may at various periods and places control production regardless of nutrient content. Field and laboratory evidence shows that growth of two nuisance macrophytes in Tennessee Valley is probably not controlled by nitrogen and phosphorus content of water. Nutrient requirements are apparently less than amounts measured and available. Organic sediment is relatively more important as nutrition sources for maximum growth than surrounding water. Amount of available light at least partly explains annual and seasonal variability in nuisance macrophyte growth. Light reaching stream or lake bottom and available for plant growth during growing season from year to year is affected by interaction of incident light, water depth, and turbidity or relative penetration. These, or related factors, were most favorable during the two years when nuisance macrophyte problems were greatest in Pickwick Reservoir, and were related to plant growth in Holston River during 1967. (Jones-Wisconsin)
W71-07698

5D. Waste Treatment Processes

ACTIVATED SLUDGE TREATMENT OF TEXTILE AND DYEING MILLS WASTE,
M. Kashiwaya.
Proceedings of the 2nd International Conference on Water Pollution Research, Tokyo, Vol 2, p 63-84, 1965.

Descriptors: *Activated sludge, *Sludge treatment, Waste water treatment.
Identifiers: *Dyeing, *Finishing process (General), *Contact-stabilization, *Textile mill wastes, Dyehouse wastes.

In the region of Ichinomiya, Besai, and Kisogawa, Aichi Prefecture, Japan, waste waters from 129 factories processing, dyeing, and finishing textiles have caused serious pollution of the Nikko River and many irrigation channels. After discussing the sources and characteristics of these waste waters, the author reports pilot-scale studies, with tabulated and graphical results, which showed that the waste waters could be treated effectively by either a conventional activated-sludge or a contact-stabilization process. (Livengood-North Carolina State University)
W71-07077

EFFECT OF SURFACE GROUPS ON ADSORPTION OF POLLUTANTS,
Lehigh Univ., Bethlehem, Pa. Dept. of Chemical Engineering.
Robert W. Coughlin.
Copy available from GPO, Sup Doc as SOD order No EP2.10:17020-06/70, $0.40; microfiche from NTIS as PB-198 519, $0.95. Water Pollution Control Research Series, Program No 17020--06/70. 29 p, 14 fig, 1 tab, 13 ref. FWQA Grant No WP-00969-01.

Descriptors: *Activated carbon, *Adsorption, *Organic compounds, Kinetics, Isotherms, Separation techniques, Solvents, Solutes, Oxidation, Mixing, Temperature, Phenols, Tertiary treatment, Waste water treatment, *Oxides.
Identifiers: *Acidic surface oxides, Specific surface area, Graphite, Regeneration.

Free valences at the edge of the graphitic layers of microcystalline carbon cause the layer edges to be very reactive, and to form surface oxides. Acidic surface oxides are commonly formed under normal operating conditions of activated carbon systems. These oxides were studied to determine their effect on the adsorptive capacity of the activated carbon. Acidic surface oxides reduce both the adsorptive capacity, and the rate of adsorption for most pollutants, such as phenol, nitrobenzene, sodium benzene sulfonate, and dextrose. The sorptive capacity and speed of sorption of urea, however, was markedly increased. It was also discovered that the changes brought about by acidic surface oxide layers were reversible. Removal of the oxides restored the carbon to its original capacity and sometimes beyond. Results of this study indicated that the effects of acidic surface oxides depend upon: (1) type of organic pollutant being sorbed; and (2) relative strength of surface oxide interactions with both the water solvent and the solute to be adsorbed. (Lowry-Texas)
W71-07078

2ND INTERNATIONAL SYMPOSIUM FOR WASTE TREATMENT LAGOONS.

Sponsored by Missouri Basin Engineering Health Council, and Federal Water Quality Administration. Edited and distributed by Ross E. McKinney, 217 Nuclear Reactor Center, University of Kansas, Lawrence, Kansas 66044. June 23-25, 1970, Kansas City, Missouri. 404 p.

Descriptors: *Oxidation lagoons, *Waste water treatment, Performance, Efficiencies, Climatic conditions, Cost analysis, *Industrial wastes, *Domestic wastes, *Lagoons.
Identifiers: Aerated lagoons, Aerobic lagoons, Anaerobic lagoons, Facultative lagoons, Applications.

Lagoons - aerobic, anaerobic, facultative, and aerated - are discussed both as to their past history and also to their future applications. Lagooning has been applied to nearly all types of wastes both domestic and industrial with success. The main reasons for this universal application are: (1) low initial cost as long as land values are reasonable; (2) minimum maintenance expenses; and (3) long system working life. The basic design considerations for the construction of lagoons are: (1) areal BOD loading; (2) temperature; (3) nature of organics present; (4) climatic conditions both as to temperature and rainfall; and (5) condition of the soil upon which the lagoons are to be built. Papers presented at the symposium cover the full range of opinions, from both proponents and opponents. Design criteria are presented for nearly every type of system configuration imaginable. The underlying theme, however, has been one of recognition of the need for more detailed and complete experiments and investigation to more fully define lagoon performance and operation. (See also W71-07080 thru W71-07127) (Lowry-Texas)
W71-07079

WASTE WATER TREATMENT AND WATER POLLUTION IN THE UNITED STATES,
Federal Water Quality Administration, Washington, D.C. Water Quality and Research.
Rienhold W. Thieme.
In: 2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 4-7.

Descriptors: *Waste water treatment, *Population, Water resources development, River basin commissions, Cost sharing, Government finance, Erosion control, Sedimentation, Farm wastes, Mu-

nicipal wastes, Industrial wastes, Planning, Regions, *Water pollution treatment.
Identifiers: *Regional planning, Federal financing, Municipal bonds, Combined sewers, Air flotation, Screening.

The population explosion is making it more and more imperative for the United States to require a greater degree of treatment of waste products from all areas. As the population grows, the water supply stays constant. Therefore, none of it can be wasted by polluting it. The government has started the movement toward cleaner water by helping state and local agencies with the financing and the technical problems involved in building a waste treatment facility. The preoccupation with the present has given way in many instances to a much more realistic view of long range future planning. The regional basin plans help to assure that money spent in one area will not be wasted. Only by turning her vast technology and manpower to the areas of natural conservation and pollution control will the United States be able to stave off disaster and famine in the coming decades. The old line policies of exploiting natural resources in such a manner as to yield the largest profit must give way to the new era of judicious management of the dwindling resources that are left. (See also W71-07079) (Lowry-Texas)
W71-07080

THE ROLE OF PONDS IN WASTE WATER TREATMENT,
South Dakota Dept. of Health. Div. of Sanitary Engineering.
M. O. Allum, and C. E. Carl.
In: 2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 7-10. 11 ref.

Descriptors: *Ponds, *Waste water treatment, Organic loading, Maintenance, Dissolved oxygen, Odor, Anaerobic conditions, Aerobic conditions, Cost analysis, Municipal wastes, Industrial wastes, *South Dakota.
Identifiers: Real estate values, Polishing.

Man made ponds designed for waste treatment have a wide variety of application to a wide range of wastes. South Dakota has state regulations governing the loading on such ponds, but little other care or maintenance is required at these installations. Pond sizes range from about .08 acres to 284 acres, and provide efficient treatment for communities whether they are overnight camp grounds, or cities of 10 to 15,000 population. Ponds have also been used for many industrial waste problems. Slaughter house wastes, food processing wastes, sugar beet processing wastes, phenols, and many other different industrial discharges have been successfully treated in ponds. Periodic inspection and repair of the dikes is virtually the only required maintenance. The cost of ponds is almost totally dependent upon land costs, and is therefore particularly suited to South Dakota's comparatively inexpensive land situation. The only serious drawback of ponds is their spring odor problems. These problems also occur during overloading, even though overall treatment may still be quite good. (See also W71-07079) (Lowry-Texas)
W71-07081

A DECADE OF CHANGE IN WASTE STABILIZATION LAGOONS IN THE MISSOURI RIVER BASIN,
North Dakota State Dept. of Health. Environmental Health and Engineering Services.
W. Van Heuvelen.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 10-13.

Descriptors: *Oxidation lagoons, *Waste water treatment, Odor, Seepage, Maintenance, Organic loading, Coliforms, Municipal wastes, Industrial wastes, Anaerobic conditions, Aerobic conditions, Missouri River.
Identifiers: *Aerated lagoons, Land values, *Missouri River basin.

Prior to 1950, the use of lagoons for waste treatment was generally discouraged in the United States. Between 1950 and 1960 increased interest in the design and operation of lagoons became evident. In 1960, there were 469 lagoons in the Missouri River Basin, and in 1970, there were 1,749. Each individual state usually has control over the critical design parameters. Much variation has been observed with respect to area and loading rates, depth, bottom and seepage control, location, multiple unit installation, etc. Benefits accruing to the states and municipalities from the use of lagoons include low initial cost, little or no maintenance, no problems with shock loading, no need for highly skilled operators and storage capacity sufficient to hold waste until desired time of discharge. Lagoons have aided many municipalities to treat effluents that otherwise would have remained untreated. Their usage is still on the increase and will probably remain so as long as land values permit them to be economically constructed. (See also W71-07079) (Lowry-Texas)
W71-07082

THE ROLE OF OXIDATION PONDS IN IMPROVING ENVIRONMENTAL HEALTH IN DEVELOPING COUNTRIES,
World Health Organization, Geneva (Switzerland).
P. A. Stevens.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 13-15. 1 tab.

Descriptors: *Oxidation lagoons, *Environmental sanitation, Population, Economic feasibility, Vectors (Biology), Snails, Sewage systems, Waste water treatment, Fertilization, Evaporation.
Identifiers: *Underdeveloped nations, Hygiene, Disease transmission, Flies.

Less than 10% of the population of most developing countries had piped water in their houses by 1962, and only a fraction of these had sewers. What sewers were available were constructed mainly to transport wastes back onto the land for irrigation. Oxidation ponds provide an economical solution for areas of this nature, but in addition to the usual construction and maintenance problems, engineers often have an acceptance problem also. Before any treatment facility can be built the population to be so serviced must want it. In many instances this is not the case. Add to this the fact that in arid areas, evaporation from the top of the pools allows precious water to be lost, waste stabilization removes nutrients from the peasant's only source of fertilizer, and the treatment of wastes becomes an economic disadvantage. At present, many countries are using waste stabilization ponds, and all reports indicate that they are economically and technically feasible. However, the overall needs, demands, and customs of a particular area must be accounted for before such a facility can be a success. (See also W71-07079) (Lowry-Texas)
W71-07083

DYNAMIC BEHAVIOUR OF OXIDATION PONDS,
Cape Town Univ. (South Africa).
G. v. R. Marais.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 15-46. 28 fig, 14 ref, append.

Descriptors: *Oxidation lagoons, *Mathematical models, *Computer simulation, Mixing, Turbulence, Temperature, Stratification, Solar radiation, Algae, Photosynthesis, Anaerobic conditions, Aerobic conditions, Sludge, Waste water treatment, Biodegradation, Biochemical oxygen demand.

A computer model of oxidation ponds stimulated interest in several parameters which were not previously considered to be important. Data was collected from the Maters North Pond in Lusaka, Zambia, and then analyzed and used to develop the computer model. This model clearly demonstrated that (1) mixing in the pond demands much greater attention as an influential parameter with respect to both the theoretical and the practical aspects, (2) advent of anaerobic conditions in aerobic oxidation ponds is a much more complex phenomenon than was previously supposed, being dependent upon temperature, mixing, algal growth and BOD in the pond, and possibly other parameters, (3) the sludge layer occupies an important position in the degradation process and directs attention to the benefits in partial separation by anaerobic pretreatment. (See also W71-07079) (Lowry-Texas)
W71-07084

DEVELOPMENT OF LAGOON DESIGN STANDARDS IN UTAH,
Utah Water Pollution Committee, Salt Lake City.
Calvin K. Sudweeks.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 46-54. 3 tab.

Descriptors: *Oxidation lagoons, *Design standards, *Waste water treatment, Municipal wastes, Organic loading, Mixing, Temperature, Precipitation, Permeability, Seepage, Groundwater, Sulfates, Coliforms, Chlorination, Biochemical oxygen demand, *Utah.
Identifiers: Logan (Utah).

The stream conditions in Utah are such that in many areas, the effluent from a waste treatment facility may be most, or in some cases, all of the total flow of the stream for much of the year. Because of this, the water quality standards of that state must be extremely stringent. As lagooning became more popular as a waste treatment device, appropriate controls were needed, but there was no information readily available concerning acceptable design standards and operational practices for aerobic lagoons. Other states were then consulted as to their practices, and the installations already functioning in Utah at that time were studied to determine what reasonable standards might be evolved. Because of the limitation of knowledge in the area, all projects sanctioned by the state are subject to testing after completion before they are finally accepted. The complete set of regulations of the state of Utah at the present time is presented along with some of the data used to arrive at these regulations. (See also W71-07079) (Lowry-Texas)
W71-07085

QUALITY PERFORMANCE OF WASTE STABILIZATION LAGOONS IN MICHIGAN,
Michigan State Dept. of Health.
Maurice S. Richmond.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 54-63. 12 fig.

Descriptors: *Oxidation lagoons, *Performance, Waste water treatment, Seepage, Odors, Percolation, Evaporation, Anaerobic conditions, Aerobic conditions, Coliforms, Fecal coliforms, Phosphates, Sampling, Hydrogen ion concentration, Biochemical oxygen demand, *Michigan.
Identifiers: *Data analysis, Total suspended solids.

A performance review of lagoons in Michigan during the period of 1961-1970 was made. The objective was to determine lagoon performance in general, and more specifically, to determine optimum conditions with respect to design and operational control under Michigan climatic conditions. DO, BOD, TSS, VSS, pH, total coliforms, and fecal coliform tests were the parameters that have been used to determine the effluent quality of water in the lagoon, and the water discharged semiannually in the late fall and early spring. The total hydraulic retention of flow is approximately 6 months. A significant fact revealed in this study was that lagoons are providing waste water treatment at least equivalent to, and in some cases better than, that

provided by conventional secondary treatment, including removal or reduction of BOD, TSS, and coliforms. One reason for this is the complete elimination of any effluent what so ever during the extensive period of total retention. By discharging during the spring and fall, maximum flows permit maximum natural degradation with minimum pollutional problems. (See also W71-07079) (Lowry-Texas)
W71-07086

EVALUATION OF LAGOON PERFORMANCE IN LIGHT OF 1965 WATER QUALITY ACT,
Ryckman, Edgerley, Tomlinson and Associates, Clayton, Mo.
G. M. Barsom, and D. W. Ryckman.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 63-80. 11 fig, 8 tab, 61 ref. USPHS Grant EH 66-611.

Descriptors: *Oxidation lagoons, *Water quality act, Waste water treatment, Eutrophication, Odors, Nitrogen, Phosphorus, Chemical oxygen demand, Biochemical oxygen demand, Mixing, Missouri.
Identifiers: *Putrefaction, Illumination, Suspended solids, Volatile suspended solids.

The bulk of the work done in the last three decades on oxidation ponds has been concerned primarily with (1) algal production and classification, and (2) development of design criteria for organic and hydraulic loadings of oxidation ponds. Lagoon performance has never been evaluated from the position of water quality criteria; nor has a comprehensive effort been made to evaluate the physical, chemical, and biological limiting factors which define lagoon performance. Therefore an evaluation program was devised to rate lagoons on the basis of water quality criteria and also on aesthetic success or failure. Lagoons in varying locations were studied for extended periods of time and evaluated. The following observations were made based on the evaluations: (1) effluent 5 day BOD from lagoons greatly exceeded the accepted effluent BOD standards, as did suspended solids both in the case of raw sewage, and tertiary oxidation ponds, and (2) removal of phosphates, nitrates, and coliforms was both in-effective and erratic. Based upon reduction of COD SS, VSS, nitrogen, and phosphorus, oxidation ponds did not significantly enhance water quality, and as presently designed, such ponds will not enhance, restore, or even maintain the present quality of receiving waters. (See also W71-07079) (Lowry-Texas)
W71-07087

FIELD STUDIES ON STABILIZATION PONDS IN SOUTH INDIA,
Missouri Univ., Rolla. Dept. of Civil Engineering.
Krishnier Purushothaman.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 80-88. 5 fig, 7 tab, 9 ref.

Descriptors: *Oxidation lagoons, Performance, *Climatic zones, Sampling, Saturation, Microorganisms, Coliforms, Biochemical oxygen demand, Dissolved oxygen, *Organic loading, Anaerobic conditions, Aerobic conditions, Depth, Waste water treatment.
Identifiers: *India, Detention time, Suspended solids.

Four experimental waste stabilization ponds were constructed at the College of Engineering, Guindy, Madras, India. Samples of the effluent and influent were obtained periodically, and analyzed for BOD, pH, and dissolved oxygen. The data was then recorded and studied to obtain information on organic and hydraulic loading, detention time, dissolved oxygen, and other parameters necessary in determining design criteria and lagoon performance. From the previously described tests, it was found that (1) when climatic conditions are favorable, lagoon loading can be increased to as much as 400% of the normal loading rates, (2) pond depth has no influence on operating efficiency under the conditions studied, (3) BOD removal efficiency was not affected by varying the detention time from 2 to 9 days, (4) dissolved oxygen was as much as 400% supersaturated during the day, but decreased to zero at night, (5) bacteria and coliform reductions were not affected by varying either depth, detention, or both, and (6) no correlation was discovered between organic loading rate, and the predominant phyto-and zoo-planktons. (see also W71-07079) (Lowry-Texas)
W71-07088

A DECADE OF STABILIZATION LAGOONS IN MICHIGAN WITH IRRIGATION AS ULTIMATE DISPOSAL OF EFFLUENT,
Williams and Works, Grand Rapids, Mich.
Earl A. Myers, and T. C. Williams.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 89-92. 1 tab, 8 ref.

Descriptors: *Waste water (Irrigation), *Oxidation lagoons, Rates of application, Crop production, *Irrigation practices, Return, *Water reuse, Recharge, Adsorption, Seepage, Erosion, Infiltration, Percolation, Sprinkler irrigation, Monitoring, Geology, Nitrogen, Phosphorus, Aerobic conditions, Anaerobic conditions, Waste water treatment, *Michigan.
Identifiers: Renovation.

The Michigan consulting engineering firm of Williams and Works has designed 28 stabilization lagoon type sewage treatment facilities, with 15 more to built shortly. All have been designed for nominal loadings of 20 lbs BOD/day/acre of water surface, and most of them have been designed for semi-annual discharge of lagoon effluent. Because of the increasingly stringent laws concerning the allowable amount of phosphorus present in waste effluent discharged to streams, irrigation has frequently been specified as a means of ultimate disposal. In the 4-R cycle of return, recycle, renovation, and reuse, irrigation plays a major role. By irrigating crops with treated effluent, the major portions of the excess nutrients such as phosphorus and nitrogen, are removed either by adsorbing into the soil particles or by utilization by the plants themselves. This process must be carefully planned and operated, both in the selection of the soil to be used and the crop to be planted, and also in the application rate. After removal in this manner, the water then either percolates through the ground and back into the groundwater table, or is drained off in surface channels to a receiving body of water. The irrigation of treated effluent depends upon the topography of the land, the type of irrigation system used, the type of crop which is able to grow in a certain area, and many other factors. However, when carefully designed, constructed, and operated, it can provide excellent treatment of lagoon effluent to insure its subsequent reuse. (See also W71-07079) (Lowry-Texas)
W71-07089

A DECADE OF RALSTON PURINA LAGOON EXPERIENCE,
Ralston Purina Co., St. Louis, Mo.
C. B. Smith.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 93-95. 3 fig.

Descriptors: *Oxidation lagoons, *Industrial wastes, *Organic loading, Odors, Maintenance, Aeration, Drawdown, Domestic wastes, Biochemical oxygen demand, Cooling water, Anaerobic conditions, Aerobic conditions, Waste water treatment, Alabama.
Identifiers: *Food processing wastes, Tussville (Alabama).

21 lagoon systems are owned or utilized by Ralston Purina Co. Types of wastes being treated are chicken and turkey dressing plant wastes, dairy wastes, rendering plant wastes, hog, dog, and cat wastes, Mink Chow mixing plant wastes, and human sewage. Lagoons, usually around 6' deep are operated at loading rates of approximately 1000 lb BOD/acre/day, with detention times between 5 and 10 days. The advantages of lagoon systems are, (1) high degree of treatment, (2) lack of odor, (3) low maintenance cost, (4) ability to handle shock loads, (5) lagoons can be utilized as a source of cooling water for condenser operation, (6) low initial cost if land is reasonable priced. Details of the construction practices of Ralston Purina's lagoon systems are included along with one specific example system located at Trussville, Alabama. (See also W71-07079) (Lowry-Texas)
W71-07090

A COMPARISON OF AN EFFICIENT LAGOON SYSTEM WITH OTHER MEANS OF SEWAGE DISPOSAL IN SMALL TOWNS,
Bowling Green State Univ., Ohio.
Karl Schurr.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 95-100. 8 fig, 9 ref.

Descriptors: *Oxidation lagoons, *Comparative costs, Population, Sampling, Biochemical oxygen demand, Chlorides, Nitrites, Nitrates, Phosphates, Coliforms, Dissolved oxygen, Turbidity, Maintenance, Waste water treatment, *Treatment facilities.
Identifiers: Suspended solids.

An oxidation lagoon and a conventional primary-secondary sewage treatment facility were compared with respect to pH, turbidity, nitrates, phosphates, nitrites, chloride, conductivity, and coliform bacteria, by comparing the final tank of the lagoon system to the receiving stream of the conventional system. The oxidation lagoon was found to provide a significantly higher degree of waste treatment at a lower cost. The results of the lagoon versus conventional treatment comparison indicate that lagoons may be of significant value in smaller towns and cities where economy is essential. In most of the smaller towns, land values are within the range of price where economical lagoons may be built. Other attractive features of lagoons are their low maintenance costs, and lesser labor requirements. More work is necessary to improve the efficiency of lagoons, but they are already a promising alternative to areas which need treatment facilities but cannot afford conventional plants. (See also W71-07079) (Lowry-Texas)
W71-07091

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
John W. Day, Jr., Charles M. Weiss, and H. T. Odum.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 100-113. 15 fig, 15 ref. Public Health Service Training Grant ES 61, National Science Foundation Sea Grant GH18, North Carolina Board of Science and Technology Grant RA005.

Descriptors: *Oxidation lagoons, *Computer models, *Mathematical model, Light intensity, Dissolved oxygen, Hydrogen ion concentration, Temperature, Carbon dioxide, Eutrophication, Respiration, Photosynthesis, Evaporation, Sedimentation, Waste water treatment, *Estuarine environment, Computer programs.
Identifiers: Differential equations, Inorganic carbon, Organic carbon.

A waste stabilization lagoon was modeled on a digital computer in PL/1 computer language. Included in the program are constants for inflow, light intensity, rate of respiration, rate of photosynthesis, and other parameters. All of these constants were determined from experimental stu-

dies of existing waste stabilization lagoons. These studies were performed in their entirety for over a year. The data was then analyzed and arranged to arrive at the desired constants. Development of a model which was deemed a satisfactory representation of the pond system allowed work to be done on the effect which various outside stimuli will have on system performance, with the desired end result being the prediction of changes which will be undergone by aquatic environments receiving a certain waste flow. The model may also be used to determine avenues of further investigation in assessing the effects of treated sewage on estuarine systems. (See also W71-07079) (Lowry-Texas)
W71-07092

STABILIZATION POND DESIGN CRITERIA FOR TROPICAL ASIA,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
M. G. McGarry, and M. B. Pescod.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 114-132. 15 fig, 6 tab, 38 ref.

Descriptors: *Oxidation lagoons, *Aesthetics, *Odors, Temperature, Organic loading, Depth, Temperate zones, Tropic zones, Comparative costs, Hydrogen ion concentration, Biochemical oxygen demand, Anaerobic conditions, Aerobic conditions, Recirculated water, Waste water treatment.
Identifiers: Facultative ponds, *Asia.

Current literature on waste water treatment using anacrobic, facultative, or anaerobic-aerobic lagoons was examined to determine what changes in design criteria were possible for the Asian environment. From these studies, the following conclusions were drawn for anaerobic ponds: (1) areal BOD laoding maintains the greatest influence on areal BOD removal, with influent pH and hydraulic detention period being less significant, (2) the maximum areal BOD laoding which will still allow the pond to stay above pH 6 will give greatest areal BOD removal, (3) maintaining maximum BOD on all stages gives greatest removal and most efficient land use, (4) recirculation of pond effluent will decrease odors but will decrease BOD removal also. For facultative ponds, equations were developed for maximum BOD removal with respect to both temperature and areal BOD loading. For many developing countries, the use of oxidation lagoons present and economical solution to pollution problems. Land restrictions, in many instances force consideration of anaerobic lagoons, but the populations of most developing countries are less conscious of aesthetics than those of developed countried. (See also W71-07079) (Lowry-Texas)
W71-07093

SURVIVAL OF ENTERIC BACTERIA AND VIRUSES IN MUNICIPAL SEWAGE LAGOONS,
New Hampshire Univ., Durham. Dept. of Microbiology.
L. W. Slanetz, Clara H. Bartley, T. G. Metcalf, and R. Nesman.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 132-141. 6 fig, 6 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Temperature, Pathogenic bacteria, Coliforms, Salmonellae, Enteric bacteria, Stagnant water, Seepage, Membrane filters, Waste water treatment, Municipal wastes.
Identifiers: *Enteric viruses, *Multi-stage lagoons, Survival rates, Fecal streptococci, Fecal coliforms.

Samples were taken from the oxidation lagoons of three communities, one community having a single pond, one a three pond series, and one a four pond series. The samples were analyzed for coliforms, fecal coliforms, fecal streptococci, salmonellae, and enteric viruses. The results were arranged in tabular form and analyzed for % removal. Die-off of coliforms ranged from 95-99% for one or two stage ponds in series at 17 to 26 C. Salmonellae and enteric viruses were isolated at all seasons from the majority of effluent samples. Coliforms showed a marked increase in survival rate during the winter temperatures of 1 to 10 C. In the three or four pond series, counts at 10 to 26 C were as low as two/ml or less for coliforms, fecal coliforms, and fecal streptococci. Salmonellae were isolated from only one out of 24 samples from the third or fourth pond during the summer periods, but the numbers of indicator organisms, and the frequency of isolation of pathogens was appreciably higher during the winter. Also, a significant number of enteric viruses were isolated from samples year around. Therefore, oxidation pond effluent discharged directly to receiving water may create health hazards. (See also W71-07079) (Lowry-Texas)
W71-07094

BACTERIA REMOVAL IN OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C.
John A. Little, Bobby G. Carrol, and Ralph E. Gentry.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 141-151. 10 fig, 2 tab, 8 ref.

Descriptors: *Oxidation lagoons, *Coliforms, Sampling, Membrane filter, Bacteria, Organic loading, Mixing, Waste water treatment, Biochemical oxygen demand.
Identifiers: Multi-cell ponds, Short-circuiting, Detention time, Most probable number, Fecal coliforms.

Nine stabilization ponds throughout the Southeastern United States were analyzed including single cell ponds, and multi-stage ponds both in series and in parallel. Grab samples of influent and effluent were measured for both total and fecal coliforms by both the MPN method and also the membrane filter method. Sampling was spread over a two year period with more than 600 samples taken and analyzed. Dilution capacities in excess of a thousand fold would be needed to prevent effluent from single celled ponds from far exceeding present water quality criteria. Multi-stage series ponds significantly enhanced removals of both fecal and total coliforms, and are highly recommended for converting single stage ponds. Also, effluent bacterial densities varied by an order of magnitude from one moment to the next in single stage ponds, indicating considerable short-circuiting problems in the single stage reactors. Organic loading has little or no effect upon effluent bacterial concentration, the most significant parameter being true detention time. Improvement was needed also in the overflow weirs, since floating solids in many cases were passed directly through the system. From the above factors, it was concluded that effluent chlorination could be needed in some cases, but that the individual situation must be studied to determine the need. (See also W71-07079) (Lowry-Texas)
W71-07095

CHLORINATION OF WASTE POND EFFLUENTS,
Sacramento State Coll., Calif.
Leonard W. Hom.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 151-159. 7 fig, 4 tab, 15 ref. National Science Foundation Grant GY3799, National Institute of Health, USPHS, WP00026-RS.

Descriptors: *Oxidation lagoons, *Disinfection, Degradation, Chlorine, Contact time, Sampling, Coliforms, Bacteria, Oxidation, Organic loading, Algae, Waste water treatment, Biochemical oxygen demand.
Identifiers: *Residual, Most probable number.

A two year series of tests were performed on effluent from experimental stabilization lagoons of the City of Concord, California, in an attempt to determine methods for controlling algae kill by controlling chlorine dosage. Three day composite samples, of 500 ml volume, were taken at three-hour intervals, and the chlorine demand was determined by the OT test using a 30 min. contact time. In addition, the samples were analyzed for BOD levels and for coliform population. Selective chlorination of stabilization lagoon effluents can be accomplished. Control of reaction and chlorine concentration is critical, since excessive chlorine can release nutrients from algal cells, thereby increasing the BOD. The solution lies in experimental optimization of both chlorine dosage and residual chlorine concentrations. Time-concentration relationships reported here provide a rational set of process design parameters for chlorine disinfection in algal-bacterial systems. (See also W71-07079) (Lowry-Texas)
W71-07096

EFFECT OF LAGOON EFFLUENT ON A RECEIVING STREAM,
Missouri Univ., Columbia.
Darrell L. King, Allen J. Tolmsoff, and Michael J. Atherton.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 159-167. 5 fig, 4 tab, 3 ref.

Descriptors: *Oxidation lagoons, *Algae, *Trickling filters, Eutrophication, Photosynthesis, Dissolved oxygen, Sedimentation, Sampling, Chemical oxygen demand, Biochemical oxygen demand, Stabilization ponds, Microorganisms, Biodegradation, Waste water treatment, Water pollution effects.
Identifiers: *Riffles, *Caloric content.

Bear Creek, a small stream whose flow is 21.5% lagoon effluent and seepage, was the site of a 90 day study which attempted to determine what stream parameters or characteristics were altered by lagoon effluent. Parameters monitored were, BOD, COD, and also volatile, suspended, and other solids measurements. The oxygen demands of the various constituents were then calculated and analyzed. From these experiments, it was determined that receiving streams for algae-laden effluents can be significantly influenced from several feet to several miles downstream. The amount of flow in the stream, and the riffle-pool ratio were found to be the factors which determine the distance downstream which a stream will be affected. Smaller streams may be broken down into riffles, which act much like trickling filters, and pools, which are merely sedimentation and digestion units. A major point of these experiments was demonstration of the fact that the receiving stream, in many cases, is an integral part of the treatment facility and must be considered as such before the total system can be evaluated. (See also W71-07079) (Lowry-Texas)
W71-07097

EFFECTS OF OXIDATION POND EFFLUENT ON RECEIVING WATER IN THE SAN JOAQUIN RIVER ESTUARY,
Federal Water Quality Administration, Pacific Southwest Region, California/Nevada Basins Office.
Richard C. Bain, Jr., Perry L. McCarty, James A. Robertson, and William H. Pierce.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 168-180. 8 fig, 6 tab, 8 ref.

Descriptors: *Oxidation lagoons, *Oxygenation, *Algae, Depth, Temperature, Photosynthesis, Reaeration, Light penetration, Nutrients, Phosphorus, Nitrogen, Tidal waters, Chemical oxygen demand, Biochemical oxygen demand, Waste water treatment, Water pollution effects.
Identifiers: *San Joaquin River.

Oxidation pond effluent entering the San Joaquin river estuary was assumed to be a major cause of low dissolved oxygen levels, and resultant fish kills. In an effort to prove or disprove this assumption, factors considered related to dissolved oxygen con-

centration were studied. These factors included water temperature, algal population, oxygen demands, nutrients, and channel and flow characteristics. Samples were taken from the river at various times, from influent and effluent from the treatment plant, and from the oxidation lagoon. They were then analyzed for NH3-nitrogen, NO3-nitrogen, organic nitrogen, organic carbon, carbonate alkalinity, bicarbonate alkalinity, orthophosphorus, total phosphorus, 5 day BOD, 30 day BOD, and COD. From the preceding investigations, it was determined that depressed oxygen levels were the result of both physical and biological factors. Physically, the deepening of the channel reduced tidal velocity and thereby reduced turbulence and rate of natural re-oxygenation, leading to lower oxygen transfer rates. Biologically, algae thrives in both the oxidation ponds and the shallow river, but is trapped in the deeper channel where light pentration is insufficient to support it. The algae then decomposes and requires oxygen. The problem then, is a complex combination of factors which requires the system approach, if a fully comprehensive solution is to be obtained. (See also W71-07079) (Lowry-Texas)
W71-07098

MATHEMATICAL SIMULATION OF WASTE STABILIZATION PONDS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Labs.
Joseph F. Roesler, and Herbert C. Preul.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 180-185. 20 ref.

Descriptors: *Oxidation lagoons, *Mathematical models, Mixing, Water re-use, Light intensity, Evaporation, Re-aeration, Dissolved oxygen, Algae, Anaerobic conditions, Aerobic conditions, Biodegradation, Seepage, Sludge, Cost analysis, *Biochemical oxygen demand, Waste water treatment.

The mass balance approach was used to obtain equations relating to oxidation lagoon processes. The model was based on the assumption that the influent was domestic sewage, and that an anaerobic sludge layer was formed at the bottom of the pond. Equations were derived for BOD removal by algae, anaerobic decomposition, and oxidation pond depth. In order to verify equations derived from the mass balance approach, experimental data on effluent BOD, detention time, sunlight intensity, temperature, evaporation rate, and dissolved oxygen deficiency were obtained from the literature. A computer program was then designed to evaluate the constants and the disposition of all BOD's. From the preceding equation and calculations, it was concluded that: (1) oxidation lagoons are economical to build and maintain, (2) the role of algae has been overemphasized, with re-aeration and anaerobic processes equally, if not more, important, and (3) since algae occasionally interfere with receiving stream water quality, investigations should be conducted in how to maximize anaerobic decomposition at the bottom and minimize algae production. (See also W71-07079) (Lowry-Texas)
W71-07099

DESIGNING WASTE PONDS TO MEET WATER QUALITY CRITERIA,
California Univ., Berkeley. Dept. of Sanitary Engineering and Public Health.
William J. Oswald, Aaron Meron, and Mario D. Zabat.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 186-194, 3 fig. 4 tab, 23 ref.

Descriptors: *Oxidation lagoons, *Design criteria, *Water quality, Algae, Harvesting, Depth, Temperature, Light intensity, Chemical precipitation, Hydrogen ion concentration, Coliforms, Bacteria, Photosynthesis, Organic compounds, Phosphates, Nitrates, Nutrients, Anaerobic conditions, Aerobic conditions, Biochemical oxygen demand, Waste water treatment.

The overall process of waste stabilization in oxidation lagoons was examined from a logical design standpoint. Significant factors were examined from the literature, and these included infectious agents, plant nutrients, organic chemicals, and land erosion and subsequent addition of minerals, chemicals, and silts, radioactive substances, and heat pollution. In each case, design practices both from literature research and practical experience were presented. A summary of the three years of operation of the Saint Helena Waste Pond system is presented in support of the design practices previously advocated. Water quality control of a high order is consistently obtained at the Saint Helena Plant, and this control is attributed mainly to these improved design practices. Further improvement may be possible with addition of algae harvesting facilities which will also remove phosphates, but since there is little or no effluent from the ponds now the present system more thatn complies with current standards. (See also W71-07079) (Lowry-Texas)
W71-07100

CURRENT DESIGN CRITERIA FOR OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C. Construction Grants and Engineering Branch.
Evan D. Dildine, and Joseph R. Franzmathes.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 194-200. 2 fig, 2 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Design criteria, Stabilization ponds, Seepage, Permeability, Evaporation, Erosion, Percolation, Mixing, Temperature, Anaerobic conditions, Aerobic conditions, Dikes, Waste water treatment.
Identifiers: *Multi-cell ponds, Start-up problems.

A brief overview of the design and operation of oxidation lagoons is presented. In the past, design of these facilities was largely a matter of chance, with experience being the best teacher in determining the final design. Now, however, with the advent of even more stringent pollution control laws, there must be analytical tests devised in order to measure pond performance and determine more fully the critical parameters involved in the design of such facilities. Although the problems associated with evolving these new design criteria are many, it is believed that under favorable conditions of climate and land values, stabilization ponds will continue to play a major role both in providing economical waste water treatment for small communities, and in helping to alleviate pollutional problems. (See also W71-07079) (Lowry-Texas)
W71-07101

NEW EXPERIMENTAL POND DATA,
Texas Univ., Austin. Environmental Health Engineering Research Lab.
E. F. Gloyna, and J. Aguirre.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 200-210. 3 fig, 10 tab, 10 ref.

Descriptors: *Oxidation lagoons, *Sludge, Anaerobic conditions, Aerobic conditions, Pilot plants, Algae, Hydrogen ion concentration, Chemical oxygen demand, *Biochemical oxygen demand, Mixing, Sampling, Organic loading.
Identifiers: Laboratory scale, *Total organic carbon.

Three laboratory-scale units and three pilot-scale unites were constructed and operated for a period of eight months at the conventionally accepted loading rates of 70 lbs BODu/acre/day and 65 day detention time for the pilot scale plants, with only 10 lbs BODu/acre/day and 90 days detention time in the lab scale units. The only difference in the three units was the location of the anaerobic sludge deposition zone. Organic removal efficiencies were determined by tests on BOD5, COD, and TOC. Suspended solids removal was determined by membrane filter analysis, and general pond characteristics were evaluated through measurement of pH, DO, temperature, nitrogen, phosphorus, and algae typing. From this experimental evaluation, it was determined that pilot scale systems are of considerable value in arriving at design criteria for a particular waste in a particular locality. Pilot plants lack many of the disadvantage of lab scale plants mainly due to the increased size, and therefore, decreased sensitivity of the pilot plants. Also, series arrangement of a multiple pond system had a much greater effect than did changing the location of the sludge deposition zone. One of the pond systems utilized for this study operated on the same principal as a series pond arrangement, and the anaerobic pretreatment portion of the system provided 50 to 76% reduction of organic material in from 3 to 5 days between 12 and 24C. (See also W71-07079) (Lowry-Texas)
W71-07102

THEORY OF AERATED LAGOONS,
Black and Veatch, Kansas City, Mo.
Henry Benjes, Jr.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 210-217. 6 fig, 1 tab, 19 ref.

Descriptors: *Oxidation lagoons, *Mathematical models, Turbulence, Mixing, Organic loading, Aeration, Dissolved oxygen, Sedimentation, Biochemical oxygen demand, Aerobic conditions, Anaerobic conditions, Sludge, Waste water treatment.
Identifiers: Aerated oxidation ponds, Facultative aerated lagoons.

Completely mixed aerated lagoons, facultative aerated lagoons, and aerated oxidation ponds have been designated as the major categories of aerated lagoons. Equations for the completely mixed aerated lagoon have been developed by three different individuals, and all three equations differ in some respect. Types of mixing equipment used, and levels of mixing provided have been demonstrated to be at least as, or possible more important than the aeration considerations. Large slower moving impellers were shown to be more efficient mixing devices than either fast moving small impellers or air diffusion devices. Facultative lagoons require less power and provide excellent treatment for wastes having a high concentration of settleable of organic settleable solids. However, the complexity of the system makes it necessarily harder to define, and as a consequence, most facultative lagoons are based on empirical design parameters. The aerated oxidation pond merely behaves like a high rate oxidation pond, drawing its oxygen supply during the warm months primarily from its algal growth, and providing satisfactory treatment even when loaded as high as 1000 lbs BOD/acre. (See also W71-07079) (Lowry-Texas)
W71-07103

AERATED LAGOONS IN ONTARIO-DESIGN AND PERFORMANCE CONSIDERATIONS,
Ontario Water Resources Commission, Toronto. Div. of Research.
B. I. Boyko, and J. W. G. Rupke.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 218-220.

Descriptors: *Oxidation lagoons, *Design criteria, Organic loading, Turbulence, Mixing, Aeration, Dissolved oxygen, Aerobic conditions, Anaerobic conditions, Sludge, Odors, Municipal wastes, Industrial wastes, Biochemical oxygen demand.
Identifiers: Multi-cell lagoons, *Ontario (Canada).

Virtually all aerated lagoons in Ontario were constructed within the last ten years. Many such installations were expected to provide total treatment of wastes, and even single stage lagoons were constructed to treat high strength industrial wastes. After ten years of experience, it is now accepted that (1) lagoons do not require 100% of treatment of organic wastes, and (2) multi-stage lagoons pro-

vide a much higher degree of treatment than do single stage installations. A volumetric loading of 2lb BOD/1000 cu. ft. is now the accepted design standard which will provide satisfactory effluent quality. However, in cases where both municipal and industrial wastes are to be treated together, the preliminary biodegradability studies should be performed on a representative sample in order to avoid having to put in too much mixing capacity, thereby disturbing the anaerobic sludge layer, in order to satisfy the oxygen demand. (See also W71-07079) (Lowry-Texas)
W71-07104

ALASKA SEWAGE LAGOONS,
Federal Water Quality Administration, College, Alaska. Alaska Water Lab.
Sidney E. Clark, Harold J. Coutts, and Robert Jackson.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 221-231. 4 fig, 2 tab, 31 ref.

Descriptors: *Sewage lagoons, *Oxidation lagoons, *Alaska, Subartic, Climatic zones, Organic loading, Eutrophication, Temperature, Mixing, Nutrients, Odor, Bacteria, Pathogenic bacteria, Sludge, Anaerobic conditions, Aerobic conditions, Biochemical oxygen demand, Waste water treatment.
Identifiers: Aerated lagoons, Facultative lagoons.

Several lagoons for waste treatment, aerated, anaerobic, and facultative, were studied to determine the feasibility of their application to colder climates. Aerated lagoons were found to provide treatment in the summer time of 80 to 88%, and removals of 80 to 90% during the winter using gross bubble air diffusion systems. Non-aerated lagoons, however, must be designed for total retention of wastes in the winter since virtually no treatment takes place then. The optimum system studied was a multicelled lagoon providing for a shallow treatment lagoon for summer treatment and a large winter lagoon for storage. The loading on such an installation was found to be less than 50 lbs BOD/acre/day to provide maximum treatment benefits. Higher loadings resulted in increasing odor problems. Selection of rugged equipment in order to minimize breakdown and repairs is essential to this type of operation, since maintenance is the largest cost involved. (See also W71-07079) (Lowry-Texas)
W71-07105

A RATIONAL APPROACH TO THE DESIGN OF AERATED LAGOONS,
Corps of Engineers, Anchorage, Alaska. Sanitary and Civil Engineering Section.
Edward F. Pohl.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 231-243. 9 fig, 3 tab, 26 ref.

Descriptors: *Oxidation lagoons, *Oxygenation, Dissolved oxygen, Saturation, Algae, Methane bacteria, Eutrophication, Nitrates, Phosphates, Biodegradation, Anaerobic conditions, Aerobic conditions, Sludge, Light intensity, Coliforms, Biochemical oxygen demand, Waste water treatment.
Identifiers: *Aerated lagoons, Suspended solids.

The various parameters involved in the design of aerated lagoons were investigated with particular reference to the use of air diffused into the lagoon through lengths of tubing. It was determined that a design for an aerated lagoon should evolve in three stages, each to be evaluated for summer and winter conditions. To design an aerated lagoon, the first stage involves evaluation of the receiving body by both the waste producers, and the agency responsible for the protection of the quality of the receiving water. The required effluent quality determination is based on BOD, suspended solids, effluent coliform organism count. Determination of the detention time required to achieve the stage I objectives is the second stage, and the final stage involves an evaluation of the oxygen needed to supply both the aeration tank mixed liquor solids respiration, and the benthal oxygen demand. Conservative overall design values are recommended because of the gaps in the research data. Until more research has been done to investigate the constants and the mechanisms of the process, conservative estimates will continue to be recommended in order to provide a larger margin of safety. (See also W71-07079) (Lowry-Texas)
W71-07106

AERATED LAGOONS FOR POTATO PROCESSING WASTES,
Federal Water Quality Administration, Corvallis, Oreg. Pacific Northwest Water Lab.
Kenneth A. Dostal.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 243-249. 2 fig, 6 tab, 6 ref.

Descriptors: *Oxidation lagoons, *Industrial wastes, Alkalinity, Organic loading, Hydrogen ion concentration, Nutrients, Biochemical oxygen demand, Anaerobic conditions, Aerobic conditions, Trickling filter, Cost analysis, Waste water treatment.
Identifiers: *Aerated lagoons, Suspended solids, *Potato wastes.

Pilot-scale plants were operated for two nine month processing seasons on potato wastes. 4200 gallons of fresh water were used to process each ton of potato wastes, producing 90 lbs of BOD, 210 lbs of COD, 110 lbs of suspended solids, .6 lbs of total phosphates as P, and 3.5 lbs of total nitrogen as N on the nine month average. Schematic diagrams of the pilot plants were constructed and are presented. From the preceding studies, the following conclusions were obtained: (1) either an aerobic lagoon or an anaerobic-aerobic lagoon series in conjunction with primary sedimentation can achieve as high as 90% BOD reduction, (2) both systems are economically feasible, the choice dependent upon local conditions, (3) constants derived from this study were used to formulate models to adequately describe BOD reduction across the ponds, (4) chemical additions were not required for either pH control or inorganic nutrient adjustment; and (5) some method of suspended solids removal will usually be required. Several full scale installations have recently been placed in service, but data is not yet available. (See also W71-07079) (Lowry-Texas)
W71-07107

AERATED LAGOON TREATMENT OF LONG ISLAND DUCK WASTES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil Engineering; and Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
Raymond C. Loehr, and Dennis D. Schulte.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 249-258. 7 fig, 2 tab, 11 ref.

Descriptors: *Oxidation lagoons, *Farm wastes, Pilot plants, Chlorination, Phosphates, Mixing, Coagulation, Flocculation, Dissolved oxygen, Biochemical oxygen demand, Aerobic conditions, Anaerobic conditions, Cost analysis, Design criteria, Mathematical models, Waste water treatment.
Identifiers: *Aerated lagoons, *Duck wastes.

Laboratory treatability studies were conducted in 1965 to determine the feasibility of treating duck wastes in a number of treatment systems. Pilot scale tests were then run on a aerated lagoon system in 1967. The pilot plant had a 250,000 gallon capacity, an 8 ft depth, and a 5 HP floating aerator. 35% of the duck waste water systems subsequently installed provided in excess of 90% BOD reduction, and 50% provided in excess of 85% BOD reduction, with aerator power relationships ranging from .008 to .04 nameplate horsepower per 1000 gallons. These systems included aerated lagoons, settling ponds, and chlorination. Studies are presently being conducted on the new methods of phosphate removal, with some type of removal to be implemented as soon as possible. (See also W71-07079) (Lowry-Texas)
W71-07108

A COMPARATIVE STUDY OF AERATED LAGOON TREATMENT OF MUNICIPAL WASTE WATERS,
Metropolitan Corp. of Greater Winnipeg (Manitoba). Water Works and Waste Disposal Div.
G. E. Burns, R. M. Girling, A. R. Pick, and D. W. Van Es.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 258-276. 14 fig, 3 tab, 6 ref.

Descriptors: *Oxidation lagoons, *Climatic zones, *Cost analysis, Temperature, Nutrients, Dissolved oxygen, Algae, Sludge, Oxygenation, Anaerobic conditions, Aerobic conditions, Biochemical oxygen demand, Waste water treatment.
Identifiers: *Aerated lagoons, Surface aerators.

Three pilot scale aerated lagoons were constructed at Winnipeg, Canada to test the effect of the Canadian prairie climatic conditions on lagoon operation. The pilot cells were of the anaerobic-aerobic type. Each lagoon was equipped with a different type of aeration system, diffused air, surface aerators, or a combination of both. Test were conducted over a 20 month period on an influent averaging 175 mg/l BOD and 188 mg/l of suspended solids. From the results of this investigation, it was concluded that aerated lagoons can satisfactorily provide secondary treatment under prairie climatic conditions. BOD removal efficiency and dissolved oxygen concentration both undergo a seasonal summer decline due to the build-up of sludge during the summer months. The prevailing consideration for economic feasibility of an aerated lagoon system is the extent and cost implications of sludge removal and disposal facilities. Also the use of surface aerators was demonstrated to be impractical in areas which sustain large amounts of ice cover. Research is continuing on the economic factors involved in sludge removal and disposal. (See also W71-07079) (Lowry-Texas)
W71-07109

BIO-FLOTATION TREATMENT IN REFINERY WASTE WATER EFFLUENTS,
American Oil Co., Whiting, Ind.
R. C. Mallatt, and J. F. Grutsch.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 276-284. 14 fig, 2 tab.

Descriptors: *Oxidation lagoons, *Oil wastes, Turbidity, Phenols, Odor, Biochemical oxygen demand, Pilot plants, Coagulation, Emulsions, Sludge, Phosphate, Baffles, Waste water treatment, Incineration.
Identifiers: *Bio-flotation, API separator, Cyclone scrubber, Skimmers.

Waste streams at the American Oil company plant at Whiting, Indiana are separated, with sanitary wastes going to the municipal wastes treatment plant, and the oily process wastes being channeled through an API separator to a biofloation unit. The solids created in the unit are either removed by skimming devices from the top or by accumulating as sludge on the bottom and being removed periodically. Brush aerators are now being installed to provide: (1) mixing (2) oxygenation, (3) fine bubbles for the air flotation of solids, (4) a velocity gradient in the water. Being installed in conjunction with the brush aerators are baffles and roller drum skimmers. To complete the treatment process, the waste sludge is accumulated, dried, and incinerated in a fluidized bed incinerator. No significant cost data on the incinerator system was available for this report, but experience gained thus far indicated that the fluidized bed incinerator

presented a practical solution to the oily sludge disposal problem. (See also W71-07079) (Lowry-Texas)
W71-07110

CURRENT DESIGN CRITERIA FOR AERATED LAGOONS,
Burns and McDonnell Engineering Co., Kansas City, Mo.
Weston E. Goodnow.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 285-286.

Descriptors: *Oxidation lagoons, *Design criteria, Temperature, Oxygenation, Loading, Biochemical oxygen demand, Waste water treatment, Tertiary treatment.
Identifiers: *Aerated lagoons, Detention time, Short circuiting.

A brief overview of the problems facing industries, consulting firms, and municipalities with respect to design criteria for aerated lagoons is presented. Many state regulatory agencies have not yet adopted standard design criteria for the design of aerated lagoons. Several items are listed as being important for regulatory agencies to consider when adopting standard design limitations. These include loading and minimization of short circuiting, plus the factors upon which these various parameters are to be based. (See also W71-07079) (Lowry-Texas)
W71-07111

AERATED LAGOONS AT HIGH ELEVATIONS,
William B. McDowell and Associates, Boulder, Colo.
Bill F. Pearson.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 286-293.

Descriptors: *Oxidation lagoons, *Design criteria, Elevation, Atmospheric pressure, Temperature, Solubility, Oxygenation, Aeration, Ice, Mixing, Organic loading, Chlorination, Disinfection, Waste water treatment.
Identifiers: *Aerated lagoons, Shock loads, Mechanical aeration, Air diffusers.

Many small towns, resort areas, and camp grounds are located at elevations above 5000 ft. Even stricter pollution measures are demanding that these areas continually upgrade their waste water treatment facilities. Stabilization lagoons, requiring little or no maintenance, capable of absorbing shock loads, and having minimal initial cost, have been proposed as a reasonable system for such communities. However, at these higher elevations, biological activity is reduced, atmospheric pressure (and oxygen solubility) is significantly decreased, and ice cover forces anaerobic conditions from which it is hard for the lagoon to recover. Aerated lagoons, however, can handle most of the previously mentioned problems. The critical factors involved in the design of aerated lagoons are the type of aeration to be used, temperature, lagoon configuration, and disinfection of effluent. A typical design analysis of an aerated lagoon is presented as a model to be followed when evaluation of a system is to be made. (See also W71-07079) (Lowry-Texas)
W71-07112

TERTIARY TREATMENT BY AERATED LAGOON,
V. N. Wahbeh, and L. W. Weller.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 293-299. 11 fig, 3 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Tertiary treatment, *Design criteria, Trickling filters, Algae, Organic loading, Odor, Coliforms, Temperature, Dissolved oxygen, Aeration, Oxygenation, Nutrients, Sedimentation, Chlorination, Slopes, Biochemical oxygen demand, Hydrogen ion concentration, Waste water treatment, Kansas.
Identifiers: *Aerated lagoons, Suspended solids.

An oxidation pond, originally designed as the treatment facility for a small community and later superceded by a high-rate trickling filter plant, was remodeled and equipped with diffused air aeration using three 600 cfm blowers. This unit provided treatment mainly for storm bypass, until it was utilized as a tertiary stage to follow the trickling filter. Tests were then conducted, using an automatic sampling device, to determine the efficiency of such an arrangement during several short testing periods. It was discovered that conventional oxidation ponds lacking aeration were ineffective in reduction of BOD, suspended solids, and inorganic nutrients unless some method of algae harvesting was employed. Aerated lagoons, however, provided in excess of 60% reduction of BOD and suspended solids, although no detectable reduction in inorganic nutrients was evidenced. Some critical parameters for design of aerated lagoons are (1) greater than 4:1 and preferably a 2:1 side slope to prevent solids deposition on the slope, and (2) minimization of water surface area prevents unwanted algal cell growth which otherwise would defeat the purpose of the use of aerated lagoons instead of oxidation lagoons. (See also W71-07079) (Lowry-Texas)
W71-07113

A SIMPLIFIED KINETIC THEORY FOR AERATED LAGOONS,
Cape Town Univ. (South Africa).
G. V. R. Marais, and M. J. Capri.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City Missouri, p 299-310. 10 fig, 11 ref.

Descriptors: *Oxidation lagoons, *Kinetics, Mathematical models, Organic loading, Sludge, Fermentation, Degradation, Dissolved oxygen, Anaerobic conditions, Aerobic conditions, Temperature, Waste water treatment, Design criteria.
Identifiers: *Operational flexibility, Completely mixed reactor, Plugflow reactor, Multi-cell reactors, Recirculation, Incremental feeding.

The operational flexibility of oxidation lagoons combined in both series and parallel operation is examined through the use of the mathematical models developed from basic reactor kinetics. The relative advantages of plug flow reactors, completely mixed reactors, and combinations of the two types are discussed in detail. Constants were evaluated from data taken from experimental lagoons in order to derive the kinetic equations. The basis for the derivation of kinetic equations and type of reactor to be used is the assumption that the degradation of biological materials in an oxidation pond is of first order. The theoretical advantages of a series reactor versus a single stage reactor were then evident. Also, a multi-cell arrangement was shown to be more capable of coping with short-term overloading both on a hydraulic and an organic basis, because of the extreme operational flexibility involved. This flexibility allowed the treatment system to actually be tailored for the specific needs of the waste to be treated. (See also W71-07079) (Lowry-Texas)
W71-07114

ANAEROBIC LAGOONS-THEORETICAL CONSIDERATIONS,
John T. Pfeffer.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 310-320. 6 fig, 6 tab, 21 ref.

Descriptors: *Anaerobic digestion, *Kinetics, Metabolism, Fermentation, Temperature, Toxicity, Alkalinity, Sulfur, Hydrogen ion concentration, Odors, Methane, Methane bacteria, Carbon dioxide, Micro-organisms, Waste water treatment, Oxidation lagoons.
Identifiers: *Anaerobic lagoons, *Environmental control, Solids retention time.

Anaerobic lagoons differ from most conventional anaerobic digestion systems only by degree of control over the operation. The operator of a conventional digester can control mixing, heating, and since these tanks are covered, oxygen can be excluded almost entirely. The anaerobic lagoon lacks this variety of environmental control, and while this lack of control lowers the cost, it also narrows the range of the applicability. Each individual installation must be carefully evaluated. Toxicity due to heavy metals, sulfides, and ammonia are not easily controlled in a lagoon system. Odor problems may also be present. Lack of temperature control means that temperature conditions must be carefully studied. Decreased temperature, and subsequent decreased biological activity results in increased sludge production per unit of organics destroyed. Waste water containing only soluble organics would require long hydraulic retention times. On the other hand, with wastes of high suspended organic load, the solids accumulated on the bottom have the benefit of greatly increased retention time, causing many materials difficult to degrade to undergo complete degradation. The advantages and disadvantages presented must all be accounted for in the final design decisions before a rational choice can be made. (See also W71-07079) (Lowry-Texas)
W71-07115

ANIMAL MANURE LAGOONS, A QUESTIONABLE TREATMENT SYSTEM,
Samual A. Hart.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 320-324. 1 tab, 19 ref.

Descriptors: *Farm wastes, *Oxidation lagoons, Organic loading, Infiltration, Evaporation, Percolation, Aeration, Oxygenation, Odors, Sprinkler irrigation, Aerobic conditions, Anaerobic conditions, Biochemical oxygen demand, Waste water treatment.
Identifiers: Aerated lagoons.

Both oxidation lagoons and oxidation ditches can be of significant value to the agriculture industry. First introduced in the early 1950's, these lagoons proved to be inexpensive to build and offer a minimum of maintenance. However, this system must be carefully designed in order to provide adequate treatment of agricultural wastes, and this care in design has not been inherent to lagoons in the past. Comprehensive field studies on cow manure have indicated that 60 ft to the third power of aerated lagoon volume is necessary to treat 1 lb BOD 5/day. In between totally mixed and aerated lagoons, and conventional oxidation lagoons are various degrees of anaerobic and aerobic treatment. Similar studies conducted on hog wastes fixed loading rates at 12 ft to the third power/400 lb pig as being capable of providing sufficient treatment. Oxidation lagoons were also studied, with loading rates of 30 ft to the third power/lb BOD5. Costs for the oxidation ditch treatment are $6 per hog of aeration equipment and $.006 per hog per day of power requirements. Overall, oxidation lagoons and ditches, and aerated lagoons can provide sufficient treatment if properly designed and maintained. (See also W71-07079) (Lowry-Texas)
W71-07116

OPERATIONAL EXPERIENCES WITH SEWAGE LAGOONS,
Dallas City Water Utilities, Tex.
C. H. Williams.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 325-332. 5 fig, 7 tab.

Descriptors: *Oxidation lagoons, *Tertiary treatment, Sludge, Mixing, Temperature, Dissolved oxygen, Anaerobic digestion, Odors, Scum, Phosphates, Cost analysis, Waste water treatment, Texas.

Identifiers: *Seeding, Detention time.

The first sludge lagoons were installed in Dallas, in 1940, and were used from then until the present time. In 1960, it became evident that they were seriously overloaded. The problem then became one of what to replace them with. After much study, a system of lagoons was constructed for use as tertiary digesters at an initial cost of $251,000. Operating costs involve 100 man hours/year and $1200 for electricity per year. In comparison, drying and/or incineration of the sludge required an initial cost of $20,000,000, and $1,000,000/year operating costs. After 7 years, 1/3 of the capacity of the lagoons has been used up and now contributes only storage for the refractory materials. A long range plan includes construction of additional multi-cell series lagoons which are further removed from populated areas. Odor control at the present installation has been imperative since the plant is completely surrounded by the City of Dallas. A better understanding of seeding of feed, mixing requirements, scum and odor control, lining of units, and the superiority of anaerobic digestion for this situation has been attained from experience with the present plant. This knowledge will be applied to future plants in their design and hopefully these plants will be much improved. (See also W71-07079) (Lowry-Texas)
W71-07117

DIGESTED SLUDGE LAGOONS,
Dayton, Ohio.
DeFro Tossey.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 333-334.

Descriptors: *Oxidation lagoons, *Tertiary treatment, *Sludge digestion, Anaerobic digestion, Odors, Groundwater, Evaporation, Infiltration, Climatic conditions, Incineration, Air pollution, Temperature, Waste water treatment, Ohio.
Identifiers: *Supernatant re-cycle.

Disposal of digested sludges in sludge lagoons has been accepted practice for the City of Dayton for 35 years. The current land disposal facilities occupy 15 acres and include both the lagoons and infiltration beds where the supernatant is used to irrigate the land. Success of sludge lagooning has been found to be dependent upon the quality of sludge entering the lagoon. Inadequate primary and secondary digestion produces troublesome conditions in a sluge lagoon system. Solids destruction continues within the bottom sludges, which are estimated to be 20 to 25% solids, helping to alleviate problems associated with poorly digested sludges. The soil through which the supernatant infiltrates has shown no signs of blinding and has become quite enriched through deposition of organic matter. No documented evidence of groundwater deterioration has been found but a system of testing is currently being organized to determine whether any deterioration is taking place. Lagooning has been economical, and land disposal has avoided both supernatant recycle and sludge incineration with its associated air pollutional problems. Both practices will therefore continue to be used by the City of Dayton. (See also W71-07079) (Lowry-Texas)
W71-07118

EXPERIENCES WITH ANAEROBIC LAGOONS IN AUSTRALIA,
Water Science Laboratories, Carlton (Australia).
C. D. Parker.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 334-347. 6 fig, 16 tab.

Descriptors: *Oxidation lagoons, *Design criteria, Anaerobic conditions, Aerobic conditions, Industrial wastes, Municipal wastes, Hydrogen ion concentration, Biochemical oxygen demand, Nutrients, Odors, Organic loadings, Sludge digestion, Climatic conditions, Waste water treatment.
Identifiers: *Australia.

A variety of Australian oxidation lagoons are discussed briefly. Data is presented from the processing of Milk and slaughterhouse wastes, vegetable and cannery wastes, textile wastes, petroleum wastes, and potato wastes, along with the municipal wastes of the surrounding areas. The 3200 acre Melbourne installation, like most of the earlier plants has an anaerobic/aerobic area ration of 1/5. However, more recent installations treating industrial wastes and where odor-free operation is essential, have been constructed on a 1/1 anaerobic to aerobic area ratio to minimize loading on the anaerobic cell. These loadings range from 400 lbs/acre/day for winter conditions in a purely anaerobic pond to 250 lb/acre/day for winter conditions in a facultative pond. Summer loadings of 400 to 800 lbs/acre/day of combined food industry and municipal wastes are common in maintaining facultative conditions. When operated within these loading limits, purely anaerobic ponds can achieve 60 - 75% BOD reduction while facultative conditions can produce a 70 to 85% reduction. Regular operational control includes pH, dissolved oxygen, sulphide, BOD, SS, and other sanitary tests, to determine operating efficiency. Sludge wastage must be practiced to assure optimum lagoon performance. This is accomplished by pumping sludge to drying beds. When properly operated, lagoons, provide efficient, economical, and odor free treatment for Australian industries and municipalities. (See also W71-07079) (Lowry-Texas)
W71-07119

ANAEROBIC LAGOON TREATMENT OF PACKINGHOUSE WASTE WATER,
Nebraska Univ., Lincoln.
Mark J. Hammer, and C. Dale Jacobsen.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 347-354. 6 fig, 3 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Industrial wastes, Anaerobic conditions, Odors, Temperature, Organic loading, Hydrogen ion concentration, Nutrients, Scum, Biochemical oxygen demand, Aerobic conditions, Sludge, Bacteria, Waste water treatment.
Identifiers: *Meat processing wastes, *Multi-cell reactors, Solids retention time, Grease, Baffles.

Anaerobic lagoons are currently being used as first stage treatment processes for meat-processing waste water in rural areas. Meat processing wastes, being of relatively high temperature (80 to 85F), high strength, and containing sufficient inorganic nutrients are highly amenable to anaerobic biological degradation. However, the variability of the process waste per unit of meat processed, the operation of by-product recovery and processing units, and the total work stoppage on week-ends produces a highly variable flow with a highly variable organic content. Anaerobic lagoons, with their storage capacity, long solids retention time, and ability to survive both periods of zero loading and periods of high or 'shock' loading, are well suited to treating packing-house wastes. Ther pertinent construction parameters in anaerobic lagoon construction are: pretreatment on the waste water; lagoon dimensions, particularly liquid depth and sideslopes; and placement of inlets and outlets. Pretreatment removes some grease and lowers the solids content which would otherwise fill the lagoon. Depths of greater than 12 feet along with sideslopes of 1 to 1 are recommended and inlets are to be placed 2-3' from the floor to prevent clogging. When operated at: organic BOD loading of 20lb BOD/1000 cu ft/day, minimum hydraulic detention time of 6 days, and minimum temperature of 75F, then BOD removal efficiences of 75% or greater are attainable. (See also W71-07079) (Lowry-Texas)
W71-07120

ANAEROBIC LAGOON TREATMENT OF PACKING WASTES IN LOUISIANA,
Louisiana State Dept. of Health, New Orleans.
James F. Coerver.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 354-359. 4 fig, 3 tab, 5 ref.

Descriptors: *Oxidation lagoons, *Anaerobic conditions, Industrial wastes, Design criteria, Aerobic conditions, Odors, Sludge, Temperature, Climatic conditions, Scum, Waste water treatment, *Louisiana.
Identifiers: *Meat processing wastes, Hog units, Blood, Grease.

Since the early 1960's some 50 slaughterhouse operations in Louisiana have constructed anaerobic lagoon facilities for treatment of paunch manure, blood, fleshing, and other unsalvage by-products. Anaerobic lagoons are mainly popular because of their low initial cost, ability to handle 'shock loads,' and dependable nuisance-free performance. A Houman, Louisiana slaughterhouse already using a lagoon system was evaluated to determine temporary design criteria so that other installations might be constructed. Volume requirements were based on the number of hog units processed per week, with all other animals being measured to equivalent hog units. Lagoon volume is still based mainly upon the number of animals processed per week, but the approximate BOD loading has been found to be 300 lb BOD/acre-ft/day. At this loading, these units have provided satisfactory BOD reductions (from 76.7 to 94.3%) with a minimum of expense. (See also W71-07079) (Lowry-Texas)
W71-07121

CURRENT DESIGN CRITERIA FOR ANAEROBIC LAGOONS,
Burns and McDonnell Engineering Co., Kansas, Mo.
James E. White.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 360-363. 4 tab, 12 ref.

Descriptors: *Oxidation lagoons, *Anaerobic conditions, Design criteria, Organic loading, Depth, Temperature, Sludge, Biochemical oxygen demand, Climatic conditions, Odors, Aerobic conditions, Waste water treatment.
Identifiers: Anaerobic lagoons, Meat-processing wastes, Textile wastes, Grease.

Pollution control agencies of the government were surveyed to determine the state of development of anaerobic lagoon design criteria. Industries currently using this type of treatment were also contacted for information on loading rates, BOD removal efficiencies, etc. The information gathered revealed that: (1) none of the states contacted had published design criteria, although many had certain accepted design criteria which they followed, and (2) the industries surveyed responded with such a variety of dimensions for the measurement of organic loading that, unless the data was complete there was no way to compare one with another. The data was seldom complete. From the available literature, and from state and local agencies, it was found that: (1) the majority of states allow loading rates of 12-15 lb BOD sub 5/1000 cu ft/day with considerable variation allowed for climatic conditions, degree of isolation, etc.; (2) lagoon temperature should be above 55 to 60F to provide efficient treatment; (3) depth should be 10 to 15 ft although care should be taken not to contaminate groundwater supplies; (4) series operation of lagoons shows little or no advantage; (5) additional treatment is required for both BOD and nutrient removal before discharge to the receiving water. (See also W71-07079) (Lowry-Texas)
W71-07122

CHALLENGE FOR WASTE WATER LAGOONS,
Federal Water Quality Administration, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
Francis M. Middletown, and Robert L. Bunch.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 364-366.

Descriptors: *Oxidation lagoons, *Waste water treatment, *Water re-use, Biochemical oxygen demand, Organic loading, Odors, Photosynthesis, Algae, Bacteria, Chlorination, Groundwater, Cost analysis.
Identifiers: Suspended solids.

Increasing use of water has necessitated greater and greater usage of reconditioned waste water as drinking water. With this greater usage has come increasingly stricter laws regarding the quality of the effluent which a treatment facility is permitted to discharge to a receiving water. Therefore treatment methods must become more sophisticated as time goes on in order that effluents not only preserve the quality of a receiving stream, but must help to restore it. In light of these facts lagoon performance must be evaluated with respect to future conditions. Lagoons have several draw backs from a water pollution standpoint. These are: (1) although coliforms may be reduced as much as 98% in a lagoon, the water quality standards for number of organisms per milliliter may still be violated; (2) if algae is allowed to pass to the receiving stream, it may become as much of a pollutional factor as the raw waste since it contains the same amount of organic matter; (3) lagoon effluent is high in suspended solids which are both aesthetically unpleasing and oxygen demanding; (4) lagoons are a threat to groundwater quality because of the difficulty in sealing them. Until now, the most attractive feature of lagoons has been their low cost. As treatment must become more sophisticated, lagoons as presently constructed will need additional treatment which will more than offset their cost advantage. Therefore, unless significant advances are made in lagoon technology, it is doubtful if lagoons will have a place in the future. (See also W71-07079) (Lowry-Texas)
W71-07123

STATE OF THE ART-OXIDATION PONDS,
North Dakota Univ., Grand Forks. Dept. of Microbiology.
John W. Vennes.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 366-376. 3 tab, 67 ref.

Descriptors: *Oxidation lagoons, *Waste water treatment, Organic loading, Biochemical oxygen demand, Solar radiation, Nutrients, Temperature, Coliforms, Chlorination, Seepage, Percolation, Evaporation, Insects, Eutrophication, Algae.

An intensive literature search of the waste stabilization pond method of treating waste water was conducted to determine the present status of such units with regard to design criteria, operational parameters, and compliance with water pollution prevention regulations. Design considerations arrived at were: (1) 1 Langley/day of radiation is sufficient to treat 1 lb BOD/acre/day; (2) multi-stage series ponds provide the best organic and bacterial removals; (3) seepage and evaporation must be considered in lagoon design since in many cases these are the only forms of effluent; (4) chlorination while killing the bacteria, will also kill the algae which will then effect an immediate organic load on the system or the receiving stream; (5) algae removal techniques must be developed since most of the organic material is not destroyed, but merely converted to algae, as are the inorganic nutrients as well. Without algae removal, oxidation pond effluent is high in organic content which may cause deterioration of the receiving stream quality. More study is needed on the mechanisms which are utilized in oxidation ponds for the removal of organics, and also on the actual measurement of the organic loadings on the facilities before organic pollutants and micro-organisms present in pond effluents can be reliably predicted. (See also W71-07079) (Lowry-Texas)
W71-07124

STATE OF THE ART-AERATED LAGOONS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
Ross E. McKinney.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 376-381. 42 ref.

Descriptors: *Oxidation lagoons, *Design criteria, Waste water treatment, Industrial wastes, Temperature, Depth, Mixing, Oxygenation, Organic loading, Biochemical oxygen demand.
Identifiers: *Aerated lagoons, Mechanical aerators, Diffused air, Detention time, Suspended solids.

Aerated lagoons became widely accepted as a form of waste water treatment in the 1960's. Their main application so far has been in the area of industrial waste treatment. Aerated lagoons have successfully treated textile wastes, paper wastes, slaughterhouse wastes, various food wastes, and many others. Because they do not depend upon algae for oxygen, aerated lagoons are more controllable by the operator. Aeration devices have been developed to supply these basins both with mixing capacity and oxygenation capacity. The two basic types in use are mechanical surface aerators, and diffused air devices, each having its own merit. Aerated lagoons have taken a place as an established waste water treatment tool. Much work remains to be done regarding the actual mixing and oxygenation requirements, true loadings, optimum depth, etc. This type of treatment is a combination of both activated sludge and oxidation ponds, and it follows predictably the fundamental kinetics derived for these two processes. When carefully designed, constructed, and maintained, it can provide economical efficient waste treatment for a wide variety of wastes. (See also W71-07079) (Lowry-Texas)
W71-07125

STATE OF THE ART-ANAEROBIC LAGOONS,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
James N. Dornbush.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 382-387. 27 ref.

Descriptors: *Oxidation lagoons, *Anaerobic digestion, Design criteria, Depth, Organic loading, Temperature, Odors, Acidity, Alkalinity, Hydrogen ion concentration, Sludge, Scum, Mixing, Nutrients, Climatic conditions, Methane bacteria, Biochemical oxygen demand.
Identifiers: *Anaerobic lagoons, Detention time.

Anaerobic lagoons have been a natural outgrowth of aerobic lagoons as aerobic systems became overloaded beyond their aerobic capacity. However, facilities which were originally designed to be anaerobic are providing much better treatment. At present, anaerobic lagoons lack a well established well documented set of design criteria based on either field data or theoretical calculations. Therefore, much research is needed to: (1) more clearly define the thermal environment throughout lagoons so that effects of temperature changes may be predicted; (2) arrive at a better effluent and influent; (3) determine the actual detention time of organics within the system; and (4) resolve the question of the relative importance of sludge accumulations as a major source of nuisance odors. (See also W71-07079) (Lowry-Texas)
W71-07126

A FIELD STUDY OF THE PERFORMANCE OF WASTE STABILIZATION PONDS SERVING SMALL TOWNS,
Kansas State Dept. of Health. Div. of Environmental Health.
Edwin D. Lyman, Melville W. Gray, and John H. Bailey.
2nd International Symposium for Waste Treatment Lagoons, June 23-25, 1970, Kansas City, Missouri, p 387-404. 18 tab.

Descriptors: *Oxidation lagoons, *Waste water treatment, *Rural areas, Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Dissolved oxygen, Sampling, Infiltration, Coliforms, Nutrients, Phosphorus, Nitrites, Nitrates, *Kansas, *Sewage treatment.
Identifiers: Detention time.

Rural areas in Kansas rely on waste stabilization ponds for sewage treatment quite heavily. The reasons for this are low initial cost, because of the relative availability of land; a highly skilled operator is not needed, and when properly maintained, the system has a long working life. Although lagoons are widely used, little knowledge of the performance of such systems was available. Therefore, three such lagoons were chosen for study. Composite samples were taken and analyzed for BOD, COD, NH3, nitrite and nitrate, phosphorus, coliforms, pH, and dissolved oxygen. From the preceding tests, BOD reductions of 85%, COD reductions of 65%, and coliform reductions of 99% were found to be common for Kansas's soil and climatic conditions. With long detention times, an effluent of 100 fecal coliform/100 ml can be consistently obtained. Water quality conditions in Kansas streams indicate that lagoon effluent will enhance overall quality characteristics, as determined from unfiltered samples. Lagoon effluent is currently being used as sole water supply for livestock and irrigation purposes in many areas of the state. Therefore, sacrifice of such effluent quality solely for the removal of inorganic nutrients seems hardly justifiable. (See also W71-07079) (Lowry-Texas)
W71-07127

INVESTIGATIONS OF PHENOLIC WASTES TREATMENT IN AN OXIDATION DITCH,
Instytut Metali Niezelaznych, Gliwice (Poland).
Jan Biczysko, and Jan Suschka.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 285-294. 3 fig, 3 tab, 4 ref.

Descriptors: *Phenols, *Trickling filters, Biodegradation, Organic loading, Thermophilic bacteria, Chemical oxygen demand, Dissolved oxygen, Sulfur, Temperature, Microorganisms, *Oxidation lagoons, Waste water treatment.
Identifiers: Oxidation ditch, *Plug flow, Mesophilic, Thiocyanates, Cyanides, Coking plants, Permanganate value, Sludge density.

Oxidation ditch treatment of high temperature phenolic waste streams from a coking plant, preceded by a trickling filter, yielded 99.9% decomposition of volatile phenols and 97.7% decomposition of non-volatile phenols. Also, a 92% reduction in permanganate value, 90% reduction of COD, 91.2% and 90% reduction of cyanides and thiocyanates respectively, and 75, 66, and 55% average decomposition of thiosulfates, sulfities, and sulfides respectively were observed during the same operation. These results were dependent upon the oxygen concentration being 1.5 mg/l above. The trickling filter was installed to allow the wastes to cool from the thermophilic to the mesophilic range. Thermophilic organisms in the filter reduced volatile phenols by 30%, cyanides by 50%, and thiosulfates by 40%. No excess sludge was produced in this operation, and solids were present in the form of regular, distinct oval flocs which settled readily. From these investigations, future treatment of high temperature phenolic waste streams should be highly efficient if the proper oxygen supply can be maintained. (See also W71-07129 thru W71-07131) (Lowry-Texas)
W71-07128

DISCUSSION OF 'INVESTIGATIONS ON PHENOLIC WASTES TREATMENT IN AN OXIDATION DITCH',
Ebara-Infilco Co., Tokyo (Japan).
T. Ide.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 295-299. 4 fig, 1 tab.

Descriptors: *Phenols, *Activated sludge, Waste dilution, Dissolved oxygen, Nitrogen, Phosphorus,

Acclimatization, Impellers, Ureas, Hydrogen ion concentration, *Oxidation lagoons, Waste water treatment.
Identifiers: *Sludge loading, Mixed liquor, Volatile suspended solids, Complete mixing, Plug flow, Orthophosphoric acid, Sparger, Stocking factory.

An activated sludge process plant for the treatment of phenolic wastes has been in operation in Japan since July 1964. Influent to the system, diluted with sanitary wastes and cooling tower water, contains approximately 500 mg/l of phenols. Nutrient nitrogen and phosphorus are added to the system at the ratio of 4.0 and 0.5 parts respectively, per 100 parts of phenols. Dissolved oxygen concentration is 2.0 mg/l and pH is 6.7 to 7.3. Phenols removal of an average of 99.8% have been obtained from this plant. This removal efficiency can be maintained only as long as the phenol sludge loading factor is less than 0.6 kg phenol/day/kg VSS. At this value sludge production is also negligible. Above this critical loading, however, efficiency gradually decreases, and excess sludge starts to build up. (See also W71-07128) (Lowry-Texas)
W71-07129

DISCUSSION OF 'INVESTIGATIONS ON PHENOLIC WASTE TREATMENT IN AN OXIDATION DITCH',
Bad Homburg (West Germany).
Werner Noack.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 299-304. 4 tab, 7 ref.

Descriptors: *Phenols, *Biodegradation, *Activated sludge, Chemical wastes, Wood wastes, Industrial wastes, Temperature, Hydrogen ion concentration, Biochemical oxygen demand, *Oxidation lagoons, Waste water treatment.
Identifiers: Nocardia, Joint clarification, Cyanide, Coking plant.

The efficiency of phenol removal was investigated for three different processes. They are: (1) high rate biological clarification in an activated sludge plant; (2) biological clarification of phenol-containing effluents of a chemical plant with nocardia; and (3) biological clarification of coking plant effluent in connection with local sewage in a conventional activated sludge plant. The results of these investigations can be summarized as follows: (1) high-loading plants should be designed for 1 kg phenol/day/cubic meter of clarifier, and 3 kg BOD sub 5/cubic meter of clarifier; (2) the single stage plant can provide sufficient treatment; and (3) joint clarification with other effluents is both economically and aquiculturally advisable. (See also W71-07128) (Lowry-Texas)
W71-07130

DISCUSSION OF 'INVESTIGATIONS ON PHENOLIC WASTE TREATMENT IN AN OXIDATION DITCH',
Instituut voor Gezondheidstechniek TNO, Delft (Netherlands).
A. Pasveer.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, 1966, Vol 2, p 304-308. 3 tab, 2 ref.

Descriptors: *Phenols, *Dissolved oxygen, *Nitrification, Industrial wastes, Biodegradation, Organic loading, Biochemical oxygen demand, Chemical oxygen demand, Bacteria, *Oxidation lagoons, Waste water treatment.
Identifiers: *Oxygenation capacity, Oxidation ditch, Thiocyanates.

The ratio of oxygenation to the loading BOD sub 5/hour is a better indication of purification in an oxidation ditch than the maintenance of a certain dissolved oxygen concentration at a certain position in the ditch. Research analyzed in this way shows wide variation in the oxygen management of two different systems even when the dissolved oxygen levels are essentially the same. This difference in measurement can also cause considerable error in COD measurement and result in misleading and inaccurate information. (See also W71-07128) (Lowry-Texas)
W71-07131

FUNDAMENTAL PRINCIPLES OF SEWAGE CHLORINATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
Chester E. Rhines.
Proceedings, Industrial Waste Conference, 21st, Mar 1966, Purdue University, Vol L, No 2, p 673-678. 4 tab, 3 ref.

Descriptors: *CHLORINATION, *Disinfection, Oxidation, Pathogenic bacteria, Sewage bacteria, Viruses, Coliforms, Aeration, Nitrites, Reduction (Chemical), Alkalinity, Biodegradation, Activated sludge, Waste water treatment.
Identifiers: Contact time, Clarification, Most probable number.

Chlorination has long been accepted for the disinfection of drinking water. Attempts at applying chlorination to raw sewage, however, have met with little or no success. Chlorine disinfection requires three conditions for efficient disinfection: (1) the chlorine must come in contact with the organism; (2) although disinfection will proceed in alkaline conditions, it does so at a much reduced rate, whereas in an acidic environment it is extremely active; and (3) lower temperature reaction conditions must be compensated for by increased contact time. The major hindrances to efficient disinfection can be removed through proper bio-oxidation and the clarification made possible for good bio-oxidation processes. Conversion of nitrogenous compounds to the nitrate form, and removal of large or clmped parasites, in addition to elimination of reducing substances and oxidation of toxic substances are all objectives accomplished by efficient bio-oxidation. From the above analysis, it is obvious that the failure of chlorine to provide adequate disinfection is largely a result of either inefficient or superficial bio-oxidation which can actually produce intermediate oxidation products which are detrimental to the disinfection process, such as nitrite nitrogen. (Lowry-Texas)
W71-07132

THE BIOCHEMISTRY OF ANAEROBIC DIGESTION,
Manhattan College, Bronx, New York. Civil Engineering Department.
John S. Jeris, Richard Schneeman, Cheng-nan Weng, Robert Gasser, and Yi-siung Su.
Available from the National Technical Information Service as PB-198 655, $3.00 in paper copy, $0.95 in microfiche. Final Report, 1970. 140 p, 23 fig, 9 tab, 45 ref, 6 append. EPA-WQO Research Grant 17070 DFK.

Descriptors: *Anaerobic digestion, *Methane bacteria, *Sludge digestion, Biodegradation, Sludge disposal, Waste water treatment, *Tracers, Radioactivity techniques, *Acids, Organic acids, *Digestion.
Identifiers: Acid degradation, Lactic acid, Propionic acid, Succinic acid.

This investigation sought to determine biochemical mechanisms in the anaerobic degradation of typical organics found in wastes by means of radioactive tracer techniques. Two liter laboratory scale digesters were used in all the radioactive tracer work. Substrate and nutrients were slug fed daily while carbon-14 compounds were slug fed one time or daily depending on the type of study being performed. Chemical analyses of the liquid feed and effluent were routinely performed along with identification of gaseous end products. Radioactivity analyses on the gases produced were conducted using liquid scintillation techniques. The degradation of propionic, succinic and lactic acids appear to be closely related with common intermediates. Propionic acid can be degraded through lactic or succinic acids and the reverse is true for each of the other two compounds. Propionic acid may also be metabolized by alpha or beta-oxidation giving rise to an intact methyl group in the methane formed, from either the number two or three carbon. A pathway for glutamic acid utilization was postulated involving the formation of two moles of acetic acid for each mole of substrate used. Oleic acid was primarily degraded by beta-oxidation. In the fermentation of benzoic acid, three moles of acetic acid were produced per mole degraded and the number one carbon was primarily converted to methane. (Bunch-EPA-WQO)
W71-07136

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
Bruce W. Cone.
Research Report YR 9341, Nov 1970. 43 p, 1 fig, 10 tab, 68 ref.

Descriptors: *Resource development, *Fiber crops, *Economic feasibility, *Forestry management, *Trees, Probability, Harvesting, Pulp and paper industry, Return (Monetary), Washington, Access routes, Nuclear reactors, Water supply, Irrigation water, Deserts, Arid lands, Humidity, Air temperature, Ornamentals, Plant growth, Crop production, Softwood, Lumber, Saw mills, Irrigable land, Economic prediction, Consumptive use, Water reuse.
Identifiers: Hanford Reservation (Washington), Calculated risk, Atmospheric factors.

Water discharged from reactors and processing plants, temperate climate, and controlled access may provide the residues to sustain a forest on the Hanford Reservation, Washington. The reservation is in a desert, where the relative humidity falls to 6%, and the temperature rises to 115 degrees. Some tree species survive in a few isolated areas as the remains of an older irrigated agriculture. To determine the economic feasibility of irrigating trees, available land, water and atmospheric factors are initially assessed. Estimates are made on the quantity of wood fiber which could be produced with a given water quantity. Finally, net returns on the most promising irrigated species (Ponderosa pine, Douglas fir, Poplar and Sycamore) are evaluated. Irrigated ornamentals also show considerable growth. The analysis concludes that it is economically feasible to establish an irrigated cottonwood or sycamore forest, providing the trees are mechanically harvested every 5 years, and the chips are used in an adjacent pulp mill. Net annual returns from cottonwood and sycamore are estimated at $23.52 and $45.54 per acre. Forest establishment under these circumatances is a calculated risk, where there is an 88% probability that present value of the cottonwood enterprise would be greater than O, and an 85% probability that it would exceed O from a sycamore enterprise. (Popkin-Arizona)
W71-07152

WATER-SEWER AND DRAINAGE PLAN FOR FORT SMITH URBANIZING AREA-PHASE II.
Arkhoma Regional Planning Commission, Fort Smith, Arkansas.

Available from the National Technical Information Service as PB-195 690, $3.00 in paper copy, $0.95 in microfiche. Arkhoma Regional Planning Commission, Fort Smith, Arkansas, June 1970. Volume II, 232 p, 7 fig, 6 tab. HUD Project No Ark P-105.

Descriptors: *Sewers, *Sewage treatment, *Drainage systems, *Urbanization, *Planning, Waste water, Waste water treatment, Water quality control, Sewerage, Municipal wastes, Water pollution, Sewage lagoons, Oxidation ponds, Sanitary engineering, Financing, Capital costs, Arkansas, Oklahoma.

Identifiers: *Regional sewer systems, *Fort Smith, Arkansas River.

A unified sanitary sewer system is recommended to serve the urbanizing area of Fort Smith which includes communities in both Arkansas and Oklahoma. Of the ten communities in this area, only Fort Smith, Van Buren and Alma have public sewer systems and public sewage treatment facilities. The others which range in population from 200 to 2,000 persons are served through individual septic tanks. It is estimated that the population will increase from the present 97,150 to 198,000 by 1990. Large distances between growth centers and a diversity of drainage areas impede the development of a unified areawide sewerage system and central disposal facilities. Sewage lift stations will be required to conduct flows to the Arkansas River to avoid constructing lengthy sewer lines. The river separates the urbanizing area into two parts. This dictates that two systems of interceptor sewers should be built paralleling the stream. It is recommended that two activated sludge sewage treatment plants be built downstream from the urbanizing area, one on each side of the river. Areawide requirements to facilitate connecting even the smallest residential developments to interceptor sewers when feasible are recommended. Interim sewage treatment facilities involving stabilization ponds or package plants are suggested until connections can be made to future interceptor sewers. Design criteria, capacity requirements, construction and operating costs, user charges, legislative needs, financing, cost sharing, existing system deficiencies, recommended improvements, and storm drainage needs are discussed. (Poertner)
W71-07191

A STUDY OF LOCAL NEEDS FOR WATER POLLUTION CONTROL FACILITIES IN FISCAL YEARS 1971-76.
National League of Cities, Washington, D.C.; and United States Conference of Mayors, Washington, D.C.

Reprinted in Congressional Record (Senate), Feb 10, 1971, p S1266--S1273. Feb 1971. 9 p, 2 tab.

Descriptors: *Water pollution control, *Waste water disposal, *Waste water treatment, *Drainage water, *Treatment facilities, *Investment, Urbanization, Cities, Municipal wastes, Estimated costs, Sewers.
Identifiers: *Capital requirements, Nationwide survey.

An extensive nationwide survey was made in 1970 of the capital requirements for constructing and improving local water pollution control facilities during the next six years. This information was requested of the National League of Cities and the United States Conference of Mayors by Senator Muskie of the Senate Public Works Committee. The survey covered 1,105 cities, counties and independent sewage treatment agencies serving a combined population of approximately 95 million persons. These communities identified needs of $21.7 billion. The survey also estimated that, based on a 5-percent inflation factor and the fact that 45 to 55 million of those persons served by sewers were not covered by the survey, total needs for public expenditures for clean water facilities during the next few years are in the range of $33 to $37 billion. The needs were separated into three categories in the mailed survey questionnaire. The needs reported were as follows: (1) primary and secondary treatment facilities, $9,311,987,574; (2) tertiary treatment facilities, $4,100,386,533; (3) interceptor and storm sewer improvements, $8,368,738,149. A significant portion of the needs reported were for interceptor sewers which are currently eligible for federal aid. Two tables are included which list the capital needs in each of the three categories. One table is a listing by states, and other a listing by individual jurisdictions within states. (Poertner)
W71-07192

THE SOUTH LAKE TAHOE WATER RECLAMATION PROJECT,
Hill (Clair A.) and Associates, Redding, Calif.
Harlan E. Moyer.
Public Works, Vol 99, Dec 1968, p 87-94. 7 fig, 1 tab.

Descriptors: *Water reuse, *Tertiary treatment, *Waste water treatment, *Waste water disposal, *California, Water utilization, Irrigation programs, Irrigation water, Pipelines, Pumping plants, Sewage treatment, Water pollution control, Water pollution treatment, Pumping, Water quality, Lake basins, Eutrophication, Financing, Sanitary engineering, Hydraulic engineering, Engineering structures.
Identifiers: *Lake Tahoe, *Indian Creek Reservoir, South Lake Tahoe, South Tahoe Public Utility District.

The planning, design, construction, financing and operation are described of a 28 million dollar water reclamation complex at the south shore of Lake Tahoe. The Lake Tahoe basin covers an area of 506 square miles, 192 of which comprise the Lake. The basin lies in California and Nevada and spreads through five counties and 65 local, state and federal agencies. A 2 1/2 mgd tertiary treatment plant was completed in 1965 to treat the effluent from the existing activated sludge plant. The primary, secondary and tertiary facilities were enlarged to 7 1/2 mgd by 1968. The process utilizes chemical coagulation, filtration through multimedia filters, ammonia stripping for nitrogen removal, and adsorbtion on activated carbon columns. Effluent, formerly used in spray irrigation of land in the basin, is now pumped through a 27 mile long pipeline constructed from the treatment plant at South Lake Tahoe to Indian Creek Reservoir. The reservoir was constructed to accept all of the effluent from the South Tahoe tertiary plant. It can store 3,225 acre-feet of reclaimed water which is used for irrigation purposes in Alpine County, California. The effluent is essentially of drinking-water quality. The reason for exporting the effluent from the Lake Tahoe Basin is to prevent any possible enrichment of Lake Tahoe waters by effluent nutrients. The plant is said to be the most advanced water reclamation facility in the world. (Poertner)
W71-07193

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.

Available from National Technical Information Service, as PB-196 637, $3.00 in paper copy, $0.95 in microfiche. Sept 1970. 126 p, 14 fig, 9 tab, 88 ref. HUD Project No D C P-12.

Descriptors: *Water supply, *Water quality control, *Waste water treatment, *Water conveyance, *Planning, District of Columbia, Virginia, Mayland, Water resources, Water resources development, Urbanization, Cities, Water demand.
Identifiers: *Potomac River, *Metropolitan Washington, Water and sewer plan, Metropolitan planning.

This report updates an earlier report, 'Water and Sewerage Facilities Planning and Programming for the Washington Metropolitan Area' prepared in 1969. It identified the existing problems and concerns; documents the progress made recently; and discusses the existing national, state and regional goals, objectives and policies regarding water and sewer facilities. A regional water and sewer plan and a short range program for the 1970-76 period are outlined. Future water and sewer policies for the region are also recommended. Growing concern is cited over the water quality of the Potomac River and Estuary along and with the need for interrelated metropolitan and basinwide planning. Critical overflows in certain sewer systems and the need for providing, expanding and implementing waste water treatment plants are some of the other concerns identified in this report. The most critical need of sewage treatment in the metropolitan area is the immediate upgrading of the Blue Plains Water Pollution Control Plant. The most vital problem of regional water supply is the low flow in both the Potomac and Patuxent Rivers during summer months. Construction of additional upstream reservoirs on the Potomac River is a critical need. One of the major concerns in water distribution within the metropolitan area is the increasing complexity of water management brought about by the demand for expansion of distribution facilities. The Potomac River is considered the best source of water supply; however, recommendations are made to explore alternate sources including water water reclamation. The water demand is expected to increase from 380 mgd in 1970 to 1,050 mgd in the 1990's. (Poertner)
W71-07202

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES).
For primary bibliographic entry see Field 06E.
W71-07222

TEMPERATURE EFFECTS ON BIOLOGICAL WASTE TREATMENT PROCESSES,
Vanderbilt Univ., Nashville, Tenn.
W. Wesley Eckenfelder, Jr., and A. J. Englande.
Waste Water Conference, University of Alaska, June 1970.

Descriptors: *Temperature, *Waste water treatment, *Aerobic treatment, *Activated sludge, Lagoons, Dissolved oxygen, *Biological treatment, Biomass, Biochemical oxygen demand, Microorganisms, Bacteria, Sewage bacteria, Thermophilic bacteria, Water pollution, Thermal pollution, *Oxidation lagoons.
Identifiers: Temperature effects.

The temperature effect on the biological processes taking place in waste stabilization ponds, activated sludge tanks and aerated lagoons is discussed. The comparison uses a modification of the Van't Hoff-Arrhenius equation from which the thermal coefficient, theta, is calculated. It was found that temperature effects are minimal on activated sludge process performance as compared to other treatment systems. The low sensitivity of the activated sludge process is primarily due to the low F/M ratio which results in biological growth. Waste stabilization pond, aerated aerobic-facultative lagoon, and anaerobic pond processes operate at a lower solids level and/or a higher F/M ratio. Because of the dispersion of the biomass within these systems, the process is more directly affected by variation in temperature. (Novotny-Vanderbilt)
W71-07321

EVALUATION OF ADVANCED TREATMENT PROCESSES FOR IMPROVING PLANT PERFORMANCE,
North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel Hill. Sanitary Engineering and Water Resources Program.
James C. Lamb, III.
Waste water Research Center Report No 12, 1970. 9 p, 6 ref.

Descriptors: *Evaluation, *Waste water treatment, *Water purification, *Design, *Technology, Biochemical oxygen demand, Nitrogen, Phosphorus, Biological treatment, Activated carbon, Distillation, Electrodialysis, Reverse osmosis, Potable water, Organic compounds, Inorganic compounds.

The gap between research pertinent to waste water treatment and technology applied in the field and design is discussed. Together with suggestions for enhancement and extension of existing processes, attention is called to the recent overemphasis on

waste water treatment and inadequate attention to water supply and treatment of municipal water. Treatment employed in municipal practice does not reduce the concentration of 40 out of 50 important constituents. This is particularly true of chemicals which contribute to the carbon-chloroform extract and many pesticides. The use of activated carbon and other new technology methods could enhance the quality of the municipal water supply. Recent suggestions are also mentioned about the possibilities of obtaining a potable water supply from relatively uncontaminated sources and establishing two or more water distribution systems in a municipality. (Wilde-Wisconsin)
W71-07352

DESIGN AND OPERATING EXPERIENCES USING DIFFUSED AERATION FOR SLUDGE DIGESTION,
Gilbert Associates, Inc., Reading, Pa. Environmental Engineering Div.
Lewis E. Ritter.
Water Pollution Control Association of Pennsylvania, 41st Annual Conference Aerobic Digestion (undated) (1969). 17 p.

Descriptors: *Sludge digestion, *Sewage treatment, *Design criteria, *Evaluation, *Operating costs, Separation techniques, Aerobic treatment, Anaerobic treatment, Activated sludge, Coagulation, Flow control, Phosphates.
Identifiers: Contact stabilization process, Sludge withdrawal parameters, Sack-type diffusers, Supernatant, Orthophosphate removal.

Aerobic sludge digestion was studied in three plants of eastern Pennsylvania. The process requires 3 to 5 cu ft digestion volume and 1 sq ft drying space per capita, and aeration rate of 20 cfm per 1000 cu ft of digester capacity. The digestion is free from obnoxious odors. Manual decanting of supernatant increases phosphate concentration in the effluent. Concentrating sludge prior to feeding increases destruction of volatile solids. Addition of lime as a drying aid and aluminum sulfate as a coagulant increases drainability and reduces time, but leads to formation of crusts of chemicals on drying beds. (Wilde-Wisconsin)
W71-07358

HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS,
Wisconsin Univ., Madison. Dept. of Civil Engineering.
J. R. Villemonte, G. A. Rholich, and A. T. Wallace.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 381-395, 1966. 6 fig, 3 tab, 5 ref.

Descriptors: *Sedimentation, *Gravity, *Flownets, Vertices, Eddies, Dispersion, Kinematics, Isotropy, Tracer, Turbulence, Dye releases, Flocculation, Waste water treatment.
Identifiers: Removal efficiencies, Hydraulic efficiency, Short circuiting, Stagnant, Quiescent, Eccentricity.

Sedimentation basins were assumed to be represented by a system consisting of: (1) stagnant or dead regions, (2) isotropic small-scale, moving eddy systems, (3) macroscopic recirculation systems. Flourescent tracer studies supported this assumption, with the result that non-ideal sedimentation basins were characterized by their flow-net scurves. Quiescent column studies were then performed to determine critical settling velocity. These studies established the settling depth as a useful criterion for determining basin performance, operation, and for making comparative analyses. This parameter can also be used as a measure of the effectiveness of an established system to treat a new waste, and the efficiency with which suspended matter will be removed. All of the above investigations aided in establishing a nearly linear correlation between hydraulic efficiency as represented by the hydraulic characteristic criteria, and removal efficiency. (See also W71-07363 thru W71-07365) (Lowry-Texas)
W71-07362

DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS,'
Birmingham Univ. (England).
M. J. Hamlin.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 404-408, 1966. 4 fig, 6 ref.

Descriptors: *Settling basins, *Sedimentation, *Density currents, Flocculation, Turbulence, Tracer, Suspensions, Efficiencies, Sampling, Baffles, Weirs, Waste water treatment.
Identifiers: *Flow-through curves, Model tanks, Suspended solids, Quiescent.

The mechanics of sedimentation basins have never been fully understood because of their complexity and the number of variables they contain which cannot be duplicated. Even in model tanks, simplifying restrictions must be made to enable any progress to be made. Density currents are present in sedimentation tanks and current research yielded the following results: (1) density current velocity is independent on flow rate; (2) effluent quality does not deteriorate significantly with increasing flow within the limits of flow of the experiment; (3) no conclusive evidence has been obtained as to the relative efficiencies of narrow tanks versus wide tanks; and finally, the most consistent results were obtained using a drowned weir. Much work remains to be done on isolation techniques needed for future experiments. (See also W71-07362) (Lowry-Texas)
W71-07363

FORMAL DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS',
Alexandria Univ. (Egypt).
Hassan El-Baroudi.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 395-399, 1966. 2 fig, 6 ref.

Descriptors: *Settling velocity, Efficiencies, Turbulence, Tracer, Dispersion, Flocculation, Sedimentation, Waste water treatment.
Identifiers: Hydraulic properties, *Geometric configuration, *Critical settling depth, Critical settling time, Ideal mixing, Detention time.

The problem of relating particle removal to hydraulic and geometric properties of a settling tank has not yet been solved. Critical settling depth for each geometric configuration must be determined by trial and error. Predicted and actual removal efficiencies have been in good agreement for certain geometric configurations, but universal application to all configurations and different floc types is impossible. Critical settling time, can replace the critical settling depth as follows: (1) plot total removal versus settling time in a quiescent tube, and average removal will take place at the critical settling time, T sub c, if there is one; (2) compute ideal removal from theoretical detention time T sub 1; (3) from the removal versus settling time plot, find the critical removal R sub c corresponding to T sub c; (4) take the ratio of T sub c to T sub 1 to be the criterion of tank performance, zero for mixing tanks and 1.0 for ideal tanks. Using this information in conjunction with the tracer dispersion curves formulated by Villemonte, Rohlich, and Wallace, the idea of deducing T sub c from dispersion curves can be accurately tested. (See also W71-07362) (Lowry-Texas)
W71-07364

DISCUSSION OF 'HYDRAULIC AND REMOVAL EFFICIENCIES IN SEDIMENTATION BASINS',
Johannesburg (South Africa).
E. J. Hall.
Proceedings, Third International Conference on Water Pollution Research, Vol 2, Munich, Germany, p 399-403, 1966. 4 fig, 5 ref.

Descriptors: *Mixing, *Flocculation, Suspension, Efficiencies, Settling velocity, Temperature, Flownet, Dispersion, Waste water treatment.
Identifiers: Hydraulic characteristics, Critical settling depth.

Critical settling depth ratio has application, at best, to specific temperature and suspended solids concentration. Even in this restricted range, previous work has demonstrated that while a broad general pattern may be reproduced, a given specific flow pattern in either a rectangular or circular basin cannot be faithfully reproduced. Further, when a suitable set of settling curves cannot be obtained, the method cannot be applied at all. Results of studies made in the field have shown solids removals far in excess of the theoretically predicted maximum. This phenomenon has been attributed to the flocculent characteristics of settling sewage. These results do not support the contention that column settling curves typify the settling characteristics of a particular basin. Ideal flow in a basin, for maximum solids removal does not conform to a classical idea of non-dispersed plug flow, since control of turbulence can aid flocculation and thereby enhance removal. In summation, the concept of critical settling depth can have no real meaning in the case of sewage settlement, largely because settled sewage exhibits the property of auto flocculation, and the rate of flocculation is dependent on the character and degree of mechanical mixing applied. (See also W71-07362) (Lowry-Texas)
W71-07365

PHOTO-FILM INDUSTRY WASTES: POLLUTION EFFECTS AND ABATEMENT,
Central Public Health Engineering Research Inst., Nagpur (India).
G. J. Mohanrao, K. P. Krishnamoorthi, and W. M. Deshpande.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 1, p 181-198, 1966. 4 fig, 12 tab, 9 ref.

Descriptors: *Ammonium compounds, *Toxicity, *Chemical precipitation, Chemical wastes, Bioassay, Acclimatization, Chemical oxygen demand, Biochemical oxygen demand, Color, Hydrogen ion concentration, Dissolved oxygen, Activated sludge, Waste water treatment.
Identifiers: Photo-film industry wastes, Laboratory effluent, TL sub m (test concentration at which fish mortality was 50%), White water, Emulsion washwater, Hydroquinone, Metol, Synergistic, Antagonistic, Alum coagulation, South India.

Tests indicated that the effluent from a proposed photo-film manufacturing plant would be toxic to fish in the receiving waters. The effluent was composed of waste waters from three different sources. In order of descending toxicity, these are the laboratory effluent, the emulsion washwater, and the white water. The TL sub m values for these effluents are 1, 5, and 10% by volume respectively. A mixture of these wastes, composited in the relative amounts in which they would be manufactured, had a TL sub m value of 5%. The wastes were toxic to biological treatment of the conventional type, but, it was found that a biological system could become acclimated to the wastes after the wastes had been treated with a coagulant. The effluent obtained after treatment of the composite sludge with 500 mg/l of alum could be handled further on an activated sludge plant after mixing with the available domestic sewage (5:3, photowaste;sewage) producing an innocuous effluent at low BOD and COD. (Lowry-exas)
W71-07366

DEGRADABLE POLLUTANTS-A STUDY OF THE NEW DETERGENTS,
California University, Berkeley. Sanitary Engineering Research Lab.
P. H. McGauhey, and Stephen A. Klein.

Proceedings of the Third International Conference, Munich Germany, Vol 1, p 353-364, 1966. 4 fig, 4 tab, 8 ref.

Descriptors: *Alkyl benzene sulfonates, *Linear alkylate sulfonate, Aesthetics, Frothing, Colorimetry, Tracers, Biodegradation, *Detergents, Biological treatment, Waste water treatment.
Identifiers: *Alcohol sulfate, *Radioassay, Foamability, Pilot experiments, Livermore, California, Sewage Treatment facility of the Sanitary Engineering Research Laboratory, California, University.

Alkyl benzene sulfonates have been loudly denounced by the American public on account of their tendency to cause foaming problems in receiving streams which are aesthetically unpleasing. Linear alkylate sulfonate has now been substituted by the detergent industry as their new synthetic surfactant, and these tests were conducted to determine whether or not additional treatment facilities will be required. The results or monitoring studies of two treatment plants during the ABS to LAS change over specifically indicate that the change over will not reduce the necessity for a high degree of treatment. Where such a high degree of treatment exists, and the effluent is diluted to a large extent, no further foaming problems should be encountered. In instances where there is little or no dilution of the waste, and/or there is no secondary treatment, then improved facilities must be constructed to adequately handle the problem. In most instances, however, sewage treatment adequate to meet the aesthetic and other objectives of water quality control, the detergent fraction of the waste will be removed satisfactorily without special treatment processes. (Lowry-Texas)
W71-07367

NEW SEWAGE DISPOSAL SYSTEM AT TAHOE CITY.
For primary bibliographic entry see Field 05E.
W71-07368

WASTE TREATMENT AT THE RATH PACKING COMPANY,
Rath Packing Co., Waterloo, Iowa.
M. J. Andera, G. R. Foss, and H. A. Brandeland.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 52-55, Mar 1966.

Descriptors: *Waste water treatment, *Industrial wastes, Municipal wastes, Sewage, Water use, Biochemical oxygen demand, Iowa.
Identifiers: *Meat packing wastes, Waterloo (Ia).

The waste water control program of the Rath Packing Company has mainly been one of education and elimination. All of the waste effluent from the plant, with the exception of sanitary wastes, is pre-treated in settling basins for removal of grease and sludge before being sent to the municipal waste water treatment plant. The main emphasis of the control program has been reduction of total waste flows through careful monitoring of waste streams and total water usage. Foremen in each of the areas were instructed, first as to how much water they were actually using, and secondly, how to eliminate or reduce water requirements for washing etc. As a result, some waste streams were segregated, leaving others clean enough to be utilized again as washwater, significantly reducing water usage. With a daily flow of 4.5 MGD, 500 to 1,000 lbs of grease are lost per day, but recovery above this level is unfeasible economically. However, the measurement of this and other pertinent parameters demonstrates the need for a well-equipped laboratory for efficiency evaluations and other development work. The key, both to laboratory and plant efficiency in pollution control, however, is education of key personnel to the responsibilities of waste water control, and the expensive consequences of neglect. (Lowry-Texas)
W71-07369

GENERAL MOTORS APPROACH TO WATER POLLUTION CONTROL,
General Motors Corp., Detroit, Mich.
For primary bibliographic entry see Field 05G.
W71-07370

THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS,
Illinois Univ., Urbana.
Rashid H. Siddiqi, R. S. Engelbrecht, and R. E. Speece.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 353-380, 1966. 8 fig, 13 ref.

Descriptors: *Activated sludge, *Kinetics, *Stabilization, *Enzymes, Synthesis, Respiration, Metabolism, Storage, Catalyst, Acclimatization, Infiltration, Hydrolysis, Adsorption, Organic loading, *Waste water treatment.
Identifiers: *Contact stabilization, *Inducible, *Constitutive, *Permease, Food to microorganism ratio, Overoxidation, Endogenous metabolism, Substrate, Activity, Langmuir adsorption isotherm.

Previous research has stated that the rate of uptake is directly proportional to substrate concentration. However, it was demonstrated in this research that exogenous soluble organic matter is transported by enzymes into the bacterial cell, and that this rate of removal can be saturated by increasing the food to microorganism ratio. Therefore, utilization of a complex waste, containing both suspended and dissolved organic matter, for studying the mechanism and kinetics of initial uptake of soluble organic matter produces erroneous results. Initial increases in removal capacity can now be attributed to the production of synthesis and respiration enzyme systems. In the same manner, decreases in removals are accounted for by the inactivation of the enzyme systems. A thorough account of the mechanisms of the enzyme systems is presented here. From this and further work, it is hoped that design and operation of contact stabilization waste water treatment processes can be more clearly defined in the interest of greater economy and efficiency. (See also W71-07372 and W71-07373) (Lowry-Texas)
W71-07371

DISCUSSION OF 'THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS',
Texas Univ., Austin.
Davis L. Ford, and W. Wesley Eckenfelder, Jr.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 368-371, 1966. 4 fig, 7 ref.

Descriptors: *Kinetics, *Metabolism, Adsorption, Stabilization, Oxidation, Colloids, Activated sludge, *Waste water treatment.
Identifiers: *Contact stabilization, Uptake site saturation, Over-oxidation, *Inactivation, Dehydrogenase, Activity, Enmeshment, Substrate, Endogenous respiration, Brewery waste.

'Uptake site saturation' is the limiting factor in biological metabolism, rather than substrate concentration. This phenomenon is known as permease saturation. Above a certain F/m ratio, biological systems are independent of substrate concentration. Uptake mechanisms and kinetics can best be observed through the use of pure culture, although the same general conclusions can be drawn from data obtained from a complex filtered waste. Basic initial uptake concepts persist, but rates and characteristics of the mechanics change from waste to waste and laboratory investigations of individual wastes must be performed. (See also W71-07371) (Lowry-Texas)
W71-07372

DISCUSSION OF 'THE ROLE OF ENZYMES IN THE CONTACT STABILIZATION PROCESS',
Stanford Univ., Calif.
Perry L. McCarty.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 2, p 372-376, 1966. 2 fig, 1 tab, 1 ref.

Descriptors: *Enzymes, *Biodegradation, Microorganisms, Bacteria, Metabolism, Adsorption, Toxicity, Infiltration, Flocculation, Activated sludge, *Waste water treatment.
Identifiers: *Contact stabilization, Contact time, Piston flow, Plug flow.

Some of the advantages of the contact stabilization process are that it requires a smaller aeration tank volume, and the stabilizing sludge offers a reserve to be drawn upon in the case of toxic wastes. However, several disadvantages are also inherent to this system. The most important of these is the phenomenon of inducible enzyme inhibition. Loss of the inducible enzymes stops biological activity. These new facts about the operations of contact stabilization versus completely mixed activated sludge necessitate a thorough study of the nature of the waste to be treated before an intelligent judgement can be made. (See also W71-07371) (Lowry-Texas)
W71-07373

FLUID-CARBON COLUMNS FOR SORPTION OF RESISTENT ORGANIC POLLUTANTS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
Walter J. Weber, Jr.
Proceedings, Third International Conference on Water Pollution Research, Munich, Germany, Vol 1, p 253-276, 1966. 10 fig, 3 tab, 17 ref.

Descriptors: *Activated carbon, *Adsorption, *Saturation, Competition, Heterogeneity, Fouling, Temperature, Hydrogen ion concentration, Waste water treatment.
Identifiers: *Fluid-carbon column, *Packed carbon column, Binding, Capacity, Particulate, Concentration, Transport mechanism, Breakthrough, Acidification, Ultraviolet adsorption, Langmuir adsorption isotherm.

Fluid-carbon contact chambers showed no increased head loss after 16 days, whereas the packed carbon column of 1.83 meter depth was clogged completely within a few hours. Packed carbon columns have a tendency for the carbon particles to adhere to each other, thus clogging the column. Factors influencing performance of fluid-carbon contactors are: (1) molecular weight of adsorbate, when two or more are mixed, (2) competition for adsorption between the components of a heterogeneous solution, and (3) pH may sometimes enhance removal is adjusted to an optimum level, although this is not always a significant factor. Fluid-carbon columns were demonstrated to have very high adsorption capacities. Packed carbon columns may adsorb 15-20% by weight when adsorbing coarse particles, whereas fluid-carbon columns have attained capacities of up to 40% by weight in heterogenous solutions. (Lowry-Texas)
W71-07374

TREATMENT OF ANIMAL WASTES AT THE GREENFIELD LABORATORIES OF ELI LILLY AND COMPANY,
Eli Lilly and Co., Greenfield, Ind.
Thomas W. Bloodgood.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 56-61, Mar 1966. 1 tab, 1 ref.

Descriptors: *Waste water treatment, *Animal wastes, *Farm wastes, Lagoon, Aeration, *Indiana, Trickling filter, Laboratories, Baffles, Biochemical oxygen demand, Toxicity.
Identifiers: Laboratory wastes, Toxicology, Clarifier, Imhoff tank, Greenfield (Ind), Eli Lilly and Company.

Since the initial installation of Eli Lilly and Company's plant at Greenfield, Indiana, $405,000 have been spent on 5 separate waste treatment facilities, mainly for the wastes of the laboratory animals used for testing and culturing of serums and antitoxins. Plant 238 consists of a baffled lagoon, half aerated and half quiescent. A 275 cfm blower is used to aerate the wastes of approximately 240 cat-

tle and 250 sheep. There is much loss due to seepage, and little surface effluent. Influent BOD sub 5 of approximately 225 mg/l is reduced to approximately 75 mg/l. Plants 237, 236, and 226 all employ modifications of the activated sludge process. Solids are screened from the influent and disposed of by a firm under contract with Lilly and Company for that purpose. Flows entering these plants originate from chickens, swine, and small laboratory animals such as rabbits, monkeys, guinea pigs, hamsters, mice, dogs, cats, and rats. Influent BOD's range from 100 to 510 mg/l, and effluents average 75 mg/l. Plant 219 is a primary treatment plant consisting of primary clarification, a surge tank clarifier and an Imhoff tank used as a digester. A 22 ft diameter high rate trickling filter and a final clarifier provide secondary treatment. The influent averages 80,000 gpd with a BOD of 150 mg/l. Effluent BOD averages 35 mg/l. These plants are operated by two men, one a Class D operator. Total operating costs are approximately $55,000 per year, excluding utilities. (Lowry-Texas)
W71-07375

WASTE DISPOSAL AT THE DANA CORPORATION PLANT, TOLEDO, OHIO,
Dana Corp., Toledo, Ohio.
L. J. Page.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 33-34, Mar 1966.

Descriptors: *Oily water, *Chemical wastes, *Separation techniques, Coolants, Oils, Oil wastes, Emulsions, Flocculation, Neutralization, Weirs, Hydrogen ion concentration, *Ohio, Waste water treatment.
Identifiers: Metal machining, Chips, Clarifier, Toledo (Ohio), Dana Corp.

Industrial wastes produced from metal machining operations at the Toledo, Ohio plant of the Dana Corporation include soluble oil, synthetic machining coolants, metal cleaning compounds, plating and other chemical materials, and washer drainings. Prior treatment facilities included a central collection header, from which all waste streams were pumped to a 2.5 million gallon reservoir and allowed to separate by gravity. Increased flows and higher levels of toxic waste materials necessitated updating of the treatment facilities. A three stage treatment facility was designed. A 75,000 gallon equalization tank is used to permit gravitational separation of 'free' oils and chemical equalization of various agents. The wastes then pass through an adjustable weir box which provides a constant outflow. At the V-notch outfall of this weir box, flocculation chemicals are added to take advantage of mixing through turbulence. The wastes then flow into a clarifier, and the pH is decreased sufficiently to produce degradation of solubilizing agents, and chemical neutralization of soaps and other emulsifiers. In tank B, small additions of lime are made to enhance flocculation, ferric sulfate is added to produce an acid attack on residual synthetic emulsifiers, and Purifloc 'A' is added as a flocculent aid. In the C-tank, or accelerator, lime adjustment of pH brings the pH to 8.0, an ideal point for release. Problems encountered are attributed mainly to metal chips which clog lines and cause increased pump wear. Methods of removal of such chips are being studied, but, at present, two 25,000 gal. storage tanks are used for holding basins during breakdowns. (Lowry-Texas)
W71-07376

RECOVERY OF EDIBLE AND INDUSTRIAL PRODUCTS FROM EFFLUENT STREAMS OF POTATO PROCESSING PLANTS,
Red River Valley Potato Processing Lab., East Grand Forks, Minn.
R. Shaw.
Proceedings, Industrial Waste Conference, 21st, May 3, 4, 5, 1966, Purdue University, Vol L, No 2, March 1966, p 13-18. 1 tab, 11 ref.

Descriptors: *Potatoes, Distillation, Microbiology, Economics, Foods, Alcohol, Effluent, *Water reuse, *Waste water treatment.
Identifiers: *Potato wastes, Starch, Edible products, *Poland.

The ever increasing volumes of waste materials, and the subsequently increasing cost of waste water treatment has caused much interest in recovery and profitable use of potato processing by-products which were formerly discharged directly to waste streams. The candidate process of greatest promise is the vertical integration of the potato industry. The potato industries of Poland and the USSR are presented as examples. In Poland, potatoes are used for four main purposes: alcohol, starch, food products, and animal feed. All by-products, except those of starch, are completely utilized. Recent developments in uses of potatoes in combined alcohol and starch plants have ennabled Russian industries to utilize a total of 95.5% of the total raw potato input. In Eastern Europe, where protein nitrogen and vitamins are in short supply, potato mash provided an excellent culture medium, thereby lessening disposal problems and increasing profit per unit. Methods and procedures followed in Eastern Europe may be at least partially applicable to potato processors in the United States. Vertical integration of the potato industry to include horticulture, distillation, and microbiology, along with increased marketing technology may well aid in the development of even better potato products with significant savings both in processing and treatment. (Lowry-Texas)
W71-07377

THE EFFECT OF INLET CONDITIONS ON OIL-WATER SEPARATORS AT SOHIO'S TOLEDO REFINERY,
Clemson Univ., S.C. Dept. of Civil Engineering.
A. T. Wallace, G. A. Rohlich, and J. R. Villemonte.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 618-625, March 1966. 8 fig, 1 tab, 2 ref.

Descriptors: *Oily water, *Separation techniques, *Dispersion, Orifices, Baffles, Jets, Weirs, Diffusion, Mixing, Oil, *Oil wastes, *Ohio, Waste water treatment, Oil-water interfaces.
Identifiers: *Oil-water separators, Inlets, Sohio, Toledo (Ohio).

Dispersion curves were obtained for two experimental basins differing only in inlet design. Oil removals, obtained by the two basins were measured at comparable flow rates. To obtain the dispersion curves, adjustable inlet gates were set at the appropriate gauge reading and the basin was allowed to operate for one full detention time to stabilize. Dye tracers were injected, and the basins were compared at separator overflow rates of 500, 1000, 2000, and 4000 gallons sq ft/day. From the previously described dispersion and oil removal tests, the reaction jet baffle inlet was again proved superior to the simple overflow inlet weir. However, because of the brief duration of the testing program, it would be desirable to obtain more comparative oil removal data from the two separators. Actual separator behaviour was demonstrated to be far short of ideal behaviour and increasing flow rates caused an even greater discrepancy. An increase of the overflow rate from 500 to 4000 gal/ft/day decreased the efficiency of the reaction jet baffle from .81 to .59, and that of a simple inlet weir from .675 to .235. (Lowry-Texas)
W71-07378

AN INVESTIGATION OF THE EFFECTS OF RESIDENCE TIME ON ANAEROBIC BACTERIAL DENITRIFICATION,
California Univ., Davis.
Stephen F. Moore, and Edward W. Schroeder.
Water Research, Journal of the International Association on Water Pollution Research, Vol 4, No 10, p 685-694, October 1970. 8 fig, 2 tab, 19 ref.

Descriptors: *Denitrification, *Anaerobic conditions, Nitrogen, Phosphorous, Microorganisms, Physiology (Animal), Cost analysis, Hydrogen ion concentration, Waste water treatment, *Anaerobic bacteria.
Identifiers: *Residence time, Washout, Complete mixing, Methanol, Batch studies.

A bench scale laboratory apparatus was utilized in the study of the effect of residence time on cell yield and reaction rates in anaerobic bacterial denitrification. The contents of the reactor were assumed to be completely mixed, to be at or near steady state, and to follow first order kinetics with respect to cell growth. Analysis of the data obtained from the reactor revealed that (1) complete mixing is essential for optimal removal of nitrate in bacterial denitrification ponds, and (2) batch studies do not adequately model a continuous flow system. Also, bacterial denitrification was greatly influenced by the bacteriology, largely a function of the rate and composition of the feed. At optimum hydraulic and organic conditions, then, there existed also an optimum residence time which was determined to be 6 days for the waste and the conditions in this particular study. Nitrate buildup, reported to be a problem in earlier work, was not observed to be a problem in a completely mixed, continuous flow reactor. (Lowry-Texas)
W71-07379

NEW APPROACH TO PHOSPHATE REMOVAL: FILTRATION THROUGH MAGNESIA,
Anne Arudel County, Dept. of Public Works, Glen Burnie, Md.
Guenter Spohr, and Andres Talts.
Public Works, Jan 1971, Vol 102, No 1, p 58-60. 3 fig, 3 tab, 5 ref.

Descriptors: *Phosphates, *Filtration, Magnesium compounds, Pilot plants, Absorption, Hydrogen ion concentration, Alkalinity, Turbidity, *Waste water treatment.
Identifiers: *Magnesium oxide, Laboratory scale, Breakthrough, Regeneration, Suspended solids.

Both laboratory and pilot scale columns were utilized to determine the efficiency of removal of phosphate when it was passed through packed columns of magnesium oxide. Two commercially available magnesium oxides were analyzed, having bulk densities varying between 55 and 125 lb per cu. ft. The magnesium oxide was placed in glass columns 2.1 cm in diameter and of varying lengths. The phosphate solution was passed through the column of 1 gpm/ft sq. Four regeneration techniques were also evaluated with respect to how well they restored original performance of new media. Removal efficiencies in excess of 90% were recorded in this experiment, in agreement with work done earlier. Further study is needed to determine the actual mechanism of removal of the phosphate from the solution. More work remains to be done concerning regeneration of magnesium oxide also. Distilled water wash plus burning restored the magnesium oxide to removal levels comparable to new media, but the process is rather costly. No cost estimates are available at this time, but this and other papers suggest that filtration through magnesium oxide may be a workable means of phosphate removal in the future. (Lowry-Texas)
W71-07380

STAINLESS STEEL IN WATER AND WASTE WATER TREATMENT,
American Iron and Steel Inst., New York. Committee of Steel Plate Producers.
E. S. Kopecki.
Public Works, Jan 1971, Vol 102, No 1, p 81-83. 2 ref.

Descriptors: *Stainless steel, *Corrosion, Maintenance, Strength, Durability, Flexibility, Stability, Weirs, *Waste water treatment.
Identifiers: Microstrainer, Tanks, Aeration systems, Buckling.

Increasing corrosiveness of influent raw waters and waste waters to treatment plants has necessitated the changeover of many items in waste treatment plants from ordinary steel or iron to stainless steel. Stainless steel, while not able to compete economically if substituted in the same thickness as rolled iron or steel, is of such greater durability and strength that it may be possible to use a thinner gage of stainless steel to do the same job. The new light gage design concept is now incorporating the use of stainless steel into the original designs rather than merely replacing existing fixture with new ones of stainless steel. Many new plants, and new additions to existing plants are utilizing stainless steel almost exclusively in areas where corrosion is a problem. As more stainless steel is used the unit cost becomes smaller, and the overall plant maintenance is also greatly decreased. (Lowry-Texas)
W71-07381

LIGHT INTENSITY AND THE VERTICAL DISTRIBUTION OF ALGAE IN TERTIARY OXIDATION PONDS,
North Carolina Univ., Chapel Hill. Dept. of Environmental Sciences and Engineering.
William R. Hartley, and Charles M. Weiss.
Water Research, Vol 4, No 11, Nov 1970, p 751-763. 7 fig, 2 tab, 18 ref.

Descriptors: *Algae, *Oxidation lagoons, *Light intensity, Ponds, Rotifers, Protozoa, Photosynthesis, Chlorophyll, Temperature, Hydrogen ion concentration, Dissolved oxygen, Stratification, Sampling, Microorganisms, Sludge, Tertiary treatment, Biochemical oxygen demand, Waste water treatment, *North Carolina.
Identifiers: Durham (NC).

Five oxidation ponds at the Third Fork Treatment Plant in Durham, North Carolina, were investigated to determine the optimum lighting conditions, the types of organisms present in different situations, and their vertical distribution in the pond levels. Samples in the ponds were taken at 3,6,9,12,15,18,21,24 inches, and the sludge layer. These samples were taken every two hours over the 24 hour diurnal cycle. The samples were preserved in 3% formalin, and then taken to the laboratory for analysis. Light intensity, pH, dissolved oxygen, and temperature were also recorded at the time of sampling. The samples taken were counted for number of organisms present, and, also centrifuged for identification of species present in lesser numbers. The surface weirs installed in the ponds affect the chemical and physical parameters of pond performance with particular reference to the dissolved oxygen concentration, it being much lower in the pond which allowed the mat to form at the surface. Eugena Rostifera will change their vertical position in the pond to reach the point of submergence where the light intensity is 75 candles/ft2. Where they were not able to move to retreat from high light intensity cysts were formed. (Lowry-Texas)
W71-07382

THEORETICAL ANALYSIS OF ACTIVATED SLUDGE DYNAMICS,
Clarkson of Technology, Pottsdam, N.Y. Dept. of Civil Engineering.
Charles R. Ott, and Richard H. Bogan.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 97, No SA1, p 1-17. 8 fig, 5 tab, 16 ref. National Science Foundation Grant No GK-180.

Descriptors: *Mathematical models, *Computer models, *Simulation analysis, *Activated sludge, Kinetics, Organic loading, Effluents, *Biochemical oxygen demand, Model studies Sludge, Waste water treatment.
Identifiers: Step functions, Transients, Hydraulic loading, Influent, Suspended solids.

A computer simulation of the complete mixed activated sludge process was formulated to determine the response of the process to time variant BOD loading and amount of sludge recycle. Mass balance equations were derived for all processes concerned with the activated sludge mechanisms and these equations were then put into the computer. Perturbations to the system were provided either as step functions or time varying inputs. The effluent BOD was then monitored to determine the effect of the various inputs to the system. From the above simulation, it was determined that the effluent BOD concentration is two orders of magnitude more sensitive to variations in influent flow rate and BOD concentration than to variations in the sludge recycle rate. Also, the biological response rate was found to be very slow, and in the absence of adequate reserves of activated sludge, sludge recycle is relatively ineffective in controlling response of the process to rapid fluctuations in input conditions. Therefore control of input flow rate and input BOD appear to provide the most effective means of process control, and BOD mass escapement can be most readily accomplished by minimizing flow fluctuations. (Lowry-Texas)
W71-07383

STUDY OF AEROBIC THERMOPHILIC PROCESSES FOR WASTE TREATMENT,
Clemson Univ., S.C. Environmental Systems Engineering Program.
C. R. Nichols.
Environmental Systems Engineering Report 66-1, June 1966. 102 p, 19 fig, 8 tab, 62 ref, append.

Descriptors: *Aerobic conditions, *Aeration, Oxygen, Mathematical model, Temperature, *Waste water treatment, Metabolism.
Identifiers: *Thermophilic conditions, *Mesophilic conditions.

An investigation was conducted to determine the substrate utilization rate, organism growth rate and yield, organism decay rate, and kinetic constants for organisms grown in continuous flow, completely mixed reactors with turbine aerators. The constants were found for identical reactors under identical conditions except for the temperature in the mesophilic reactor being 26C and 54C in the thermophilic reactor. The reactors were closed systems with provisions for monitoring of influent and effluent gas and liquid streams. The substrate consisted of 1800 mg/l of glucose as the carbon and energy source and other elements necessary for growth. Evaluation of the data indicated that an oxygen limited situation existed at the lower residence times causing a change in the original proposed mathematical model which placed limitations on the data. The thermophilics were especially limited by this situation due to their high metabolic rate and low solubility of oxygen in water at the thermophilic temperatures. Little difference was found in the continuous flow 'constants' at the two temperatures. This was not expected and was probably due to oxygen limitations at the lower flow rates. (Ellis-Texas)
W71-07384

EFFECTS OF ALKYLBENZENE SULFONATES ON YEASTS,
Georgia State Univ., Atlanta. Center for Disease Control.
For primary bibliographic entry see Field 05A.
W71-07387

INDUSTRIAL WASTES FROM SCOURING RUG WOOLS AND THE REMOVAL OF DIELDRIN,
Wiedman and Singleton, Atlanta, Ga.
Robert D. Wilroy.
Proceedings Eighteenth Industrial Waste Conference, Apr 30, May 1-2, 1963, Purdue University, Lafayette, Ind, p 413-417, 1964.

Descriptors: *Anerobic digestion, *Dieldrin, Lagoons, Waste water treatment, Industrial wastes.
Identifiers: *Wool scouring, *Textile mill wastes.

Wool scouring waste can be effectively treated provided consideration is given to the requirements of the amount of treatment prior to discharge of waste. Dieldrin, a moth-proofing agent, can be treated and the agent can be removed down to a level of .25 mg/liter, but further dilution is necessary to reduce this level below the toxic limit. The treatment of wool scouring waste in a lagoon is of the anaerobic type and is effective both during summer and winter in the Southeastern United States. (Robinson-North Carolina State University)
W71-07406

CURRENT WATER QUALITY CONTROL PRACTICES,
For primary bibliographic entry see Field 05A.
W71-07409

COOLING TOWERS BOOST WATER REUSE.

Environmental Science and Technology, Vol 5, No 3, p 204-206, Mar, 1971. 4 fig.

Descriptors: *Cooling towers, *Water reuse, Marketing, *Thermal pollution, Cooling water, Water treatment, Operating costs.
Identifiers: *Cooling costs.

Cooling towers are now widely used in the petroleum and petrochemical industries, especially with the present drive for thermal pollution control. The largest market for cooling towers is electrical plants, as the electrical power use doubles every ten years. Brief description is given of various types of cooling systems, together with comparison of their economical and environmental features. Hyperbolic towers are being scrutinized from the viewpoint of their large initial costs and lack of functional efficiency in the United States. Cooling tower prices range from cheap models (plywood, galvanized steel hardware) whose cost is estimated at $5 per gallon, to the more expensive ones (silica-bronze, stainless steel, etc.) which will cost $12-$13 per gallon of recycled water. Water treatment requirements are presented from the viewpoint of the four common operational problems: corrosion, scale, deposition fouling and microbiological attack. (Oleszkiewicz-Vanderbilt)
W71-07438

PARING MERCURY POLLUTION,
Mark D. Rosenzweig.
Chemical Engineering, Vol 78, No 5, p 70-71, Feb 22, 1971. 2 fig.

Descriptors: *Heavy metals, *Industrial wastes, *Waste water treatment, Ion exchange, Filtration, Chemical precipitation.
Identifiers: *Mercury recover, *Chlor-alkali plants waste treatment, Osaka Soda process, Ventron Corporation process.

Two already commercialized flow-schemes for treatment of chlor-alkali plants' effluents are presented, both aiming at the upgrading of wastes quality and mercury recovery. In the Osaka Soda process, successfully applied for 5 years, the waste water after sedimentation and filtration, followed by ion exchange, is passed to a tower containing Osaka Soda's 'MR' resin. Mercury is cut to an undetectable level with fresh resin, although it gradually builds up to 5 ppb and is typically 2 ppb. The operating costs are about $1/1000 gal of effluent. Just commercialized Ventron process utilizes sodium borohydride (NaBH4) to precipitate mercury-yielding elemental mercury and cleaning the wastes stream well below 10 ppb mercury. Taking into account the costs of recovered mercury, operating costs of this process are about $1 per lb of recovered mercury. The author indicates also that other processes are being developed by Environmental Engineering. Pilot-scale data has demonstrated the feasibility of reducing the concentration of mercury contaminants in minutes, from 1000-2000 ppm to 50 ppb. (Oleszkiewicz-Vanderbilt)
W71-07450

HEXAVALENT CHROMIUM: TOXICOLOGICAL EFFECTS AND MEANS FOR REMOVAL FROM AQUEOUS SOLUTION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07454

SUMMARY OF COMMERCIAL WASTE WATER TREATMENT PLANTS,
Air Force Weapons Lab., Kirtland AFB, N. Mex.
James A. Mahoney.
Available from the National Technical Information Service as AD-860 067, $3.00 in paper copy, $0.95 in microfiche. Technical Report No AFWL-TR-69-121, Sept 1969. 66 p, 11 fig, 5 tab, 8 ref.
Identifiers: *Sewage treatment, Evaluation, *Packaged sewage plants, *Air force procurement, Packaged sewage plants, Activated sludge process, Aeration, Cost estimates, Reviews, Construction, Field tests, Electric power demand, Contractors, Lagoons, Ponds, Biochemical oxygen demand.

Commercially available packaged waste water treatment plants are cataloged and reviewed for possible Air Force application in limited war and fixed base installations. Definitions of the various methods of treatment are included. Simple curves are furnished for a quick estimate of costs, power requirements, erection time, shipping volume and weight in relation to flow capacity. Included are tables which relate the performances of a number of plants tested by the National Sanitation Foundation, by the manufacturer, and by the Florida State Board of Health. A list of firms which manufacture packaged waste water treatment plants is included in an appendix.
W71-07458

HOW WE SOLVED OUR LIME SLUDGE DISPOSAL PROBLEM,
Water Department, Sioux Fall, S.D.
For primary bibliographic entry see Field 05F.
W71-07459

POLYELECTROLYTE CONDITIONING OF ALUM SLUDGES,
Quible and Associates, Chase City, Va.; and Virginia Polytechnic Inst., Blacksburg, Va.
For primary bibliographic entry see Field 05F.
W71-07464

REVIEW OF SLUDGE DISPOSAL PRACTICES,
Corps of Engineers, Washington, D.C., Washington Aqueduct Div.
For primary bibliographic entry see Field 05F.
W71-07465

THE ORLY WATERWORKS OF THE CITY OF PARIS.
Degremont, Rueil (France).

Water and Water Engineering, Vol 74, No 890, p 135-146, Apr 1970. 6 fig, 1 tab.

Descriptors: *Water purification, *Sludge treatment, Flocculation, Filtration, Chemical properties, Water works, Municipal water.
Identifiers: *Orly waterworks, *Alum recovery, Prechlorination, Dlarification, Aquazur V Filters, Aluminum sulphate, Paris (France).

The treatment technology is utilized at a water purification plant employing a coagulant recovery process is described. This highly automated treatment facility handles a normal flow capacity of 66 million gallons per day of Seine River water. Details of the pretreatment, clarification, filtration, sterilization reagent storage and feeding, pumping, alum recovery, and monitoring, electrical, and control equipment facilities are provided. Filtration is accomplished under a 3.9 foot head of water. This head is required to prevent the degassing of the process water in the filters during low and hot weather flows. The sludge from the clarification units is concentrated at 8g/l and then acidified with sulfuric acid to pH 3 to 3.2. The acidified sludge is fed to settling basins where the aluminum sulphate solution is recovered. The remaining sludge is neutralized with calcium carbonate in separate tanks. Physical and chemical characteristics of the water at different stages of the treatment process are presented. A flow diagram of the plant is also provided. (Nardozzi-AWWA)
W71-07470

RECALCINING LIME SLUDGE PRODUCES MULTIPLE BENEFITS,
Water Department, St. Paul, Minn.
Clifford W. Hamblin.
The American City, Vol 84, No 11, p 67-69, 115, Nov 1969. 2 fig, 2 tab.

Descriptors: *Carbon dioxide, *Water softening, Stabilization, Air pollution, Minnesota, Sludge treatment, Water works, Municipal water.
Identifiers: *Lime recalcining, *Washwater recovery, Quicklime, St Paul (Minn).

This study shows how lime recalcining and washwater recovery at a municipal water utility can reclaim 9800 tons of 92% pure quicklime, 9950 tons of carbon dioxide and 170 million gallons of washwater annually. Extensive modifications to the existing facilities will permit handling of the 23,000 tons of dry solids produced annually while extending the life of sludge storage and reducing air pollution. Sedimentation of filter washwater is accomplished in separate settling basins. The carbon dioxide produced from the recalcining facility will be used to stabilize the softened water. It is expected excess quicklime can be recovered and sold to reduce plant operating costs. A flow diagram of the 60 ton per day raw sludge vertically constructed fluid bed type recalcining system is presented. Fuel requirements are 9 million Btu/ton of product output. Chemical characteristics of the lime sludge and the equipment required for construction are shown. (Nardozzi-AWWA)
W71-07471

NATURAL FREEZING FOR DEWATERING OF ALUMINUM HYDROXIDE SLUDGES,
Federal Water Quality Administration, Cincinnati, Ohio.
J. B. Farrell, J. E. Smith, Jr., R. B. Dean, E. Grossman, III, and O. L. Grant.
Journal American Water Works Association, Vol 62, No 12, p 787-791, Dec 1970. 5 fig, 2 tab, 9 ref.

Descriptors: *Snow cover, *Freeze-thaw test, *Lagoons, Dewatering, Phosphorus, Waste water treatment, *Freezing, Minnesota, Ohio, Sludge treatment.
Identifiers: *Filterability, *Solids contents, Aluminum sulfate, Aluminum hydroxide siudge, Ely (Minn), Cincinnati (Ohio).

Data presented provide a basis for the design of lagoons for the dewatering of aluminum hydroxide sludge by natural freezing. Temperature considerations and convective losses are considered in the freezing experiments. The freezing rate of aluminum hydroxide sludge parallels the freezing rate of water. Field testing at Ely, Minnesota showed that a snow cover could reduce the freezing efficiency of the sludge, but careful management could minimize this problem by freezing the sludge in thin layers and removing snow from frozen layers. With complete freezing, the dewaterability and solids content of the sludge can be significantly increased. Freezing in a mild climate as Cincinnati, Ohio would be successful in 1 inch layers. Layered freezing in partial freeze-thaw tests was not as a complete freezing. The ratio of phosphorus to aluminum in the sulfate form is shown to barely affect the filterability and solids content of aluminum hydroxide sludges. (Nardozzi-AWWA)
W71-07472

THE USE OF FILTER PRESSES FOR THE DEWATERING OF SLUDGES,
Johnson-Progress Ltd., Stoke-on-Trent (England).
C. M. Thomas.
Journal Water Pollution Control Federation, Vol 43, No 1, p 93-101, Jan 1971. 4 fig, 1 tab, 5 ref.

Descriptors: *Dewatering, Waste water treatment, Sludge disposal, Filtration.
Identifiers: *Filter presses, *Chemical conditioning, Water plant sludge.

The utility of a filter press to successfully dewater various waste water treatment sludges is presented. The advantages of a filter press operation are cited for a specific range of application over alternative methods as centrifugation, thickeners, vacuum filters, and pressure filters. The enumerated benefits include efficient filtration even with feed characteristic variations, minimized maintenance, improved filtrate quality, facility in cake handling, and competitive capital costs. Design consideration should be based on theory and pilot testing. Additional requirements for filter pressing may include sludge storage tanks and mixers, chemical conditioning plants, feed pumps, filter cloths, interconnecting pipework and pressure vessels, and filtrate collection trays. Conditioning, filtration cycle, feed and cake characterization, and cake thickness data are presented for water plant sludge. (Nardozzi-AWWA)
W71-07474

CHEMICAL COAGULATION OF KRAFT MILL WASTE WATER,
California Univ., Berkeley. Engineering Research Lab.; and Mississippi State Univ., State College; and International Paper Co. Mobile, Ala.
E. Joe Middlebrooks, W. E. Phillips, Jr., and Frank J. Coogan.
Water and Sewage Works, Vol 116, No 3, p IW7-IW9, Mar 1969. 4 fig, 1 tab, 4 ref.

Descriptors: *Coagulation, *Chemical oxygen demand, Biochemical oxygen demand, Color, Waste water treatment, Pulp wastes, Pulp and paper industry, Industrial wastes.
Identifiers: *Organic polymers, *Aluminum sulfate, *Kraft mill waste water, Colloidal suspensions, Suspended solids.

Colloidal suspensions which contain significant proportions of color, suspended solids, and chemical oxygen demand material in paper mill waste water can be removed by chemical coagulation with organic polymers. Analytical grade aluminum sulfate and 6 organic polyelectrolytes were tested on kraft mill waste water. Previous work with synthetic polymers and ferric sulfate is referenced. The coagulants were tested on grab samples and composite samples from the raw waste stream. The jar test procedure and parameter analysis techniques are explained. The organic polymers were equally effective in reducing chemical oxygen demand material, color and suspended solids. The aluminum sulfate was effective but tripled the sludge volume produced by the organic polymers. The coagulation efficiency changed with variations in the solution pH. None of the coagulants utilized could significantly reduce the biochemical oxygen demand of the waste. (Nardozzi-AWWA)
W71-07475

WATER TREATMENT PLANT WASTES DISPOSAL,
Orange County Sewer Districts, Orlando, Fla.
Robert McColgan.
Report to AWWA Research Foundation, Nov 11, 1970. 7 p, 2 ref.

Descriptors: *Injection wells, Sludge disposal, Sludge treatment, Lagoons, Neutralization, Dewatering, Filtration, *Water treatment, Wastes, Florida.
Identifiers: Alum coagulation, Aluminum hydroxide sludge, Activated carbon sludge, Pipeline disposal, Gamma ray sludge destruction, Nalco671,

Lake Washington, Florida Aquifer, Melbourne (Florida).

The project goal was to determine effective treatment or disposal of activated carbon and aluminum hydroxide sludges and the neutralization of the supernatant before discharge to a lake. Sludge disposal techniques included injection wells and pipeline disposal to roadbase pits. Sludge treatment methods included gamma ray sludge destruction, dewatering, and filtration. Sludge injection caused clogging of the aquifer and elimination of the groundwater as a potential supply. Pipeline disposal created a dewatering problem in the roadbase pits. A 0.1mg/l Nalco 671 polymer addition generated less sludge than radiation treatment and was as effective. Vacuum filtration, sand bed drying, centrifugation, and filter pressing concentrated sludge solids up to 20%. Basic research is recommended for sludge lagoons. Lagoon design considerations are a 2 1/2 foot maximum depth, a 10 foot clearance for dump trucks, and a buffer zone between lagoons and residential communities. (Nardozzi-AWWA)
W71-07476

RESEARCH ON WATER TREATMENT PLANT WASTE DISPOSAL,
American Water Works Association Research Foundation, New York.
Harry A. Faber.
Water and Sewage Works, Vol 117, No 11, p 379-383, Nov 1970. 4 ref.

Descriptors: *Freezing, *Dewatering, *Centrifugation, Phosphates, Lagoons, Water reuse, Water treatment, *Sludge disposal, Coagulation, Treatment facilities.
Identifiers: *Aluminum hydroxide sludge, *Lime recovery, *Ferric hydroxide sludge, Precoat vacuum filtration, Thickening, Sludge conditioning, Polyelectrolyte, Filter pressing, Primary coagulant.

A survey highlighting active research, demonstration, and in-plant studies of sludge and and filter washwater disposal. The problem of economical waste disposal techniques for purification and softening plant sludges is being investigated in various areas. The disposal of aluminum and ferric hydroxide sludges and the recalcination of lime sludge are enumerated for several dewatering processes. The survey cites references to freezing, centrifugation, precoat vacuum filtration, thickening, filter pressing, and lagooning procedures. Water reuse and phosphate removal systems are also listed. Projects examining sludge conditioning through chemical addition, and operations substituting polyelectrolytes as primary coagulants to treat filter washwater or raw water are discussed. A systematic program for the organization, coordination, and dissemination of research and demonstration projects is stressed. A central information resource program would promote pollution control technology beneficial to the water utility industry. (Nardozzi-AWWA)
W71-07477

DISPOSAL OF WASTE WATER FROM WATER FILTRATION PLANTS,
Metcalf and Eddy, New York.
G. P. Fulton.
Journal American Water Works Association, Vol 61, No 7, p 322-326, July 1969. 1 fig, 2 ref.

Descriptors: *Pollution abatement, Settling basins, Coagulation, Filtration, Sludge treatment, Sludge disposal, Waste water treatment, New York.
Identifiers: *Concentration, *Sludge freezing, *Alum recovery, Clarifier underflow, Filter backwash water, Monroe County Shoremont Plant (New York).

Processes for the successful treatment and disposal of potential pollutants from settling basin underflows and filter backwash water were examined to identify pollution abatement techniques. Limited physical and chemical characteristics of waste water were qualitatively and quantitatively reviewed to evaluate sludge freezing, alum recovery, vacuum filtration operations, and consideration was given to the disposal of water plant wastes to local sewage systems. Treatment goals of concentrating wastes and making these wastes suitable for disposal are discussed. Treatment cost is reportedly minimized by simplifying operations for personnel and limiting land area unit requirements. A settling rate of 250 gpd/ft sq was found acceptable for settling alum sludge, in its semifluid state, by using mechanical thickeners. The advantages and disadvantages of the treatment schemes are presented. Sludge freezing and alum recovery processes are referenced to plant scale operations. (Nardozzi-AWWA)
W71-07478

ALTERNATIVES FOR PHOSPHATE REMOVAL,
Neptune Microfloc, Inc., Corvallis, Oreg.
Stewart Davis.
Water and Sewage Works, Vol 117, No 10, p 336-338, Oct 1970. 2 fig, 1 tab, 2 ref.

Descriptors: *Water quality control, Tertiary treatment, Chemical precipitation, Lime, Flocculation, Phosphates, Waste water treatment.
Identifiers: *Tube settlers, *Mixed-media filter, Micro Floc, Shagawa Lake Project, Detention time, Alum.

Micro FLOC has developed a tertiary treatment process that can effectively remove orthophosphates and polyphosphates by chemical precipitation. Domestic waste water phosphous has been reduced to .5mg/l P using lime dosages of 200 to 500 mg/l CaO or alum dosages of 90 to 200 mg/l. The process combines flocculation, modular tube settlers, and mixed media filtration. Units range in size from 20 gpm to 200 gpm. Four 200 gpm units, requiring less detention time than conventional treatment systems, are being planned for Ocean Pines, Maryland. A Micro FLOC installation at Shagawa Lake has reduced effluent from 5.6 mg/l to 0.05 mg/l (PO4 as P) using 145 mg/l alum. Similar advanced treatment processes as Battelle Northwest's 100,000 gpd trailer mounted system and a 280,000 gpd at Tualatin, Oregon are mentioned. A reference is also made to Lake Tahoe's lime coagulation system and recalcination operation. (Nardozzi-AWWA)
W71-07479

WASTE ALUM AND ACTIVATED CARBON SLUDGE SOLIDS REDUCTIONS METHODS,
Orange County Sewer Districts, Orlando, Fla.
Robert McColgan.
Report to AWWA Research Foundation, Nov 1970. 7 p, 6 fig, 2 ref.

Descriptors: *Waste storage, *Landfills, Sludge treatment, Sludge disposal, Florida, *Water treatment, Wastes, *Lagoons.
Identifiers: Alum sludge, Activated carbon sludge, Sludge transfer, Sludge thickening, Carryover, Melbourne (Florida).

A technique is described to limit alum and activated carbon sludge carryover from a waste storage lagoon of a water treatment plant. Initially, buckets were dragged through the settling lagoon to remove the sludge. This technique re-suspended settled material and produced a carryover in the effluent. A new lagoon of 2 1/2 to 3 feet deep with a 2 to 1 slope was constructed. Pumping enabled a sludge transfer from the original, primary lagoon to the new thickening lagooning. Sludge thickening was accomplished at the influent end of the lagoon, and the supernatant was recycled to the primary lagoon. The solids content of the thickened sludge was 6 to 10%. After additional drying, the sludge was used as a landfill. (Nardozzi-AWWA)
W71-07480

PLANNING OF MUNICIPAL WASTE WATER RENOVATION PROJECTS,
J. W. Porter.
J Am Water Works Assoc, Vol 62, No 9, p 543-548, Sep 1970. 3 fig, 2 tab, 6 ref.

Descriptors: *Water reuse, *Economics, *Cost comparisons, *Project planning, Water pollution control.

Increasing interest in water renovation and reuse rather than simply waste treatment and discharge is due to the severity of pollution control laws and localized shortages of water resources. Economic considerations concern cost comparisons between the water pollution control/water supply functions of a water renovation facility, and the same functions in separate facilities. Technical considerations in planning a water renovation project are largely a function of the planned use of the product water. Several technical aspects are discussed including: process selection and water quality criteria, renovation system reliability, public health considerations, and pilot - demonstration work. The functions of water pollution control and water supply should be recognized institutionally, which involves cooperation between parties concerned. Five guidelines are included as suggestions in planning for public acceptance of water renovation.
W71-07515

TERTIARY TREATMENT OF SEWERAGE WATER,
Shozo Miyahara, and Tokiya Ando.
Sangyo Kogai, Vol 6, No 8, p 454-461, Aug 25, 1970. 46 ref.

Descriptors: *Tertiary treatment, *Water purification, *Water resources, *Feasibility.
Identifiers: *Sewerage water, *Japan.

Because of the increasing water need, the feasibility of sewerage water reuse is being investigated both technically and chemically. This new advanced method of utilization, tertiary treatment, is aimed at higher level purification of sewerage water beyond the secondary treatment stage. Due to projected water demand sewerage water has a great potential as a new water resource if advanced technology is employed. Some problems involved in sewerage water reuse are associated with water quality including: generation of corrosion, slime scale and ABC foaming, higher seasonal temperatures, and chloride ion concentration. Sewerage water reuse is presently limited in its application to cooling and washing uses. Discussed herein are several types of tertiary treatment for sewerage water primarily involving removal of suspended solids, nitric or phosphoric compounds, organic substances, and chlorine contained in sewerage water after secondary treatment.
W71-07516

INDUSTRIAL RE-USE OF COMBINED SEWAGE-TREATMENT PLANT EFFLUENT,
E. R. Hamilton, and C. F. Gurnham.
In: International Conference on Water for Peace, Vol 4, 1968. 12 p.

Descriptors: *Storm runoff, *Bypasses, *Water pollution sources, *Treatment facilities, Overflow, Sewage disposal, Water reuse, Illinois.
Identifiers: *Storm sewage, *Chicago (Ill), *Treatment method.

After reviewing the increasing water demands of the United States and the problems of future water shortage, the authors describe the steps taken at East Chicago, Illinois, to overcome problems of pollution and water shortage. Excess storm sewage which bypasses the sewage works enters Grand Calumet river and thence the southern part of Lake Michigan, causing serious restriction on the use of water for recreational purposes, particularly swimming. It is financially impossible to replace the combined sewerage system by a separate system;

also, storm runoff is highly polluting. A scheme was therefore developed which will receive effluent from the existing sewage works and overflows of storm sewage from about one-third of the city, providing treatment by equalization, sedimentation, oxidation, and biological processes. In dry weather there will be a detention period of at least 10 days; and at peak storm periods there will be a minimal detention period of 24 hours. Discharge from the detention basins will be chlorinated and held in the overflow channel for the customary disinfection period of 15 minutes before entering the Grand Calumet river. It is proposed that flows up to 20 mgd will pass from the detention basin to a new tertiary treatment plant, on which pilot-scale studies are being made. The quality of the effluent will not only meet the anticipated standards for discharge to the Grand Calumet river, but will approach requirements for potable use and will be acceptable for use as cooling water and often as industrial process water. The plant will be flexible in operation, and water of almost any desired quality could be tapped off at various points for sale to industry.
W71-07517

STORM WATER/SEWAGE CONTROL,
Walter J. Talley.
Effluent and Water Treatment Journal, Vol 10, No 10, p 592-595, Oct 1970.

Descriptors: *Screens, Equipment, Waste water treatment.
Identifiers: *Combined sewers, *Storm overflows, *Waste water concentrator.

The combined sewer overflow problems affect approximately 36 million people in England and Wales, and 51 million people in the United States. Over a year's period, estimates on the percent of liquid sanitary sewage that overflows with the storm overflow in combined sewer systems vary from 2% to 10%. High-rate, fine-mesh screens and the waste water concentrator, which are the products of research basically directed at finding means for storage and treatment of storm/sanitary overflows, are discussed briefly.
W71-07528

CAN POLYMERS HELP YOUR COLLECTION SYSTEMS,
I. W. Santry.
Water Wastes Eng, Vol 7, No 11, p 47-48, Oct 1970. 2 fig, 1 ref.

Descriptors: *Overflow, *Sewers, Flow rate, Peak loads, Waste water treatment.
Identifiers: *Polymers, *Collection systems.

The use of polymers, formed by chain grouping of similar organic molecules being cationic, anionic, or nonionic, reduce fluid flow friction resulting in an increased velocity in a sewer during application for varying distances downstream. What happens in the system is that the long chains of high molecular organic material dampen the eddy viscosity conditions making greater use of streamlining and the extension of the laminar boundary layer into the turbulent flow region. At present polymers appear to be limited to short time uses that occur because of peak flows and other emergencies.
W71-07529

STORM-WATER RETENTION CAN WORK...AND PREVENT THE HEAVILY POLLUTED 'FIRST FLUSH' FROM OVERFLOWING TO DAMAGE THE RECEIVING RIVER,
For primary bibliographic entry see Field 05G.
W71-07530

FINE-MESH MECHANICAL SCREEN CONCENTRATES PEAK WASTE LOADS.

Filtration Eng, Vol 1, No 10, p 8-10, Jun 1970. 2 fig.

Descriptors: *Waste water treatment, *Pollution abatement, *Overflow, *Sewers, Storm runoff, Equipment.
Identifiers: *Waste water concentrator.

A new product known as the waste water concentrator uses a mechanical screening principle to reduce pollution caused by the overflow from combined storm and sanitary sewage systems during periods of heavy rainfall. In storm overflow service, the concentrator can augment a treatment process via high-rate, fine mesh centrifugal screening which relieves the existing system of its hydraulic overload. It was demonstrated that the concentrator is capable of removing 99 percent of the floatable and settleable solids, 34 percent of the suspended solids, and 27 percent of the COD from sanitary waste. A description of the operation, apparatus, and maintenance involved in the concentrator's performance is given.
W71-07534

PRIMARY WATER TREATMENT AIDED BY COMPACT SEPARATOR.
Sweco, Inc., Los Angeles, Calif.

Chemical Engineering, Vol 77, No 15, p 48, 50, Jul 13, 1970. 1 fig.

Descriptors: *Sewage treatment, *Waste water treatment, *Sewage, *Storm runoff, Pollution abatement.
Identifiers: *Waste water concentrator.

A new kind of primary waste water treatment has been introduced to help pollution abatement specialists solve two of their most recurrent headaches: inadequate acreage for large enough settling basins, and excessive waste water loads resulting from heavy rainfalls. The waste water concentrator, as this unit is called, was designed primarily for municipal sewage treatment.
W71-07535

A GROWING MARKET FOR WATER AND WASTE WATER TREATMENT EQUIPMENT,
K. L. Kollar, and William G. Youngwirth.
Water Sewage Works, Vol 117, No 9, p 319-325, Sept 1970. 7 tab, 2 chart, 8 ref.

Descriptors: *Treatment facilities, Equipment, Evaluation, *Construction equipment, *Surveys, Waste water treatment, Costs.

This report summarizes and compares two studies (1965 and 1968) which are based on the response of manufacturers to a questionnaire on manufacturing plant production capacity and value of shipments of equipment used only in water and waste water treatment plants. Both surveys accounted for about 95% and 70% of equipment sales to municipal water and waste water treatment utilities and industrial water and waste water treatment respectively. In 1968, $248.4 million was spent for water and waste water treatment equipment by municipalities and industry with a 64..% increase in pollution control equipment. Tabled information includes: total expenditures, equipment shipments, structures, production capacities, and GNP comparisons. A list of equipment definitions is given.
W71-07539

THE MICROBIOLOGY OF BUILT UP POULTRY LITTER,
Edinburgh Univ. (Scotland). Dept. of Bacteriology.
Henrietta Schefferle.
Journal Applied Bacteriology, Vol 28, No 3, p 403-411, 1965. 5 tab, 7 ref.

Descriptors: *Microbiology, *Bacteria, Farm wastes, Poultry, Odor, Fungi, Aerobic conditions, Laboratory tests, Alkalinity, Enteric bacteria, Lactobacillus, Hydrogen ion concentration, Temperature, Moisture content.
Identifiers: Litter, Coryneform bacteria, Enterococci.

The numbers of viable bacteria in built up poultry litter were found to be 10 to the 10th power - 10 to the 11th power/g fresh weight and appeared to be little affected by factors such as age, temperature, moisture content and pH. Counts for unused litter and poultry droppings were lower. In built up litter of high alkalinity coryneform bacteria were predominant; micrococci occurred sporadically and small numbers of nocardias, streptomycetes, aerobic spore formers and streptococci were encountered. A variety of Gram negative bacteria also occurred, the numbers of which appeared to be controlled by alkalinity; they were less abundant in litters where the pH and buffering capacity were high. Strongly alkaline conditions also tended to lower the fungal counts but had no effect on the count of enterococci. (Christenbury-Iowa State)
W71-07548

INVESTIGATIONS ON FLY CONTROL BY COMPOSTING POULTRY MANURES,
Orange County Health Department, Santa Ana, Calif.
Roy E. Eastwood, Jimmy M. Kade, Robert B. Schoenburg, and Harold W. Brydon.
Journal of Economic Entomology, Vol 60, No 1, p 88-98, Feb 1967. 7 fig, 7 tab, 5 ref.

Descriptors: *Farm wastes, *Poultry, Aerobic conditions, Temperature, Degradation, Decomposing organic matter, Aeration, Mixing, Larvae, Bulk density, Volume, Moisture content, Nitrogen.
Identifiers: *Composting, Fly problems, Fly pupae, Windrows.

Windrow composting of poultry manure was investigated during several months of the year. Results obtained indicated that manure does not have to be ground prior to composting. Bulking and drying materials are not required in composting poultry manure. Fly larvae were reduced in numbers during the composting process so that they would not create a fly problem. Poultry manure once composted is not suitable as an oviposition site for adult flies and the subsequent development of larvae. A twice-weekly turning schedule with a manure spreader is desirable to help prevent fly larvae from pupating and emerging by bringing them into contact with the hot interior of the pile. (White-Iowa State)
W71-07549

DAIRY SET-UP FOR 200 COWS,
Guy Faulkner.
Power Farming, p 38-39, Jan 1970. 6 fig.

Descriptors: *Farm wastes, Lagoons, Slurries, Cattle, Hogs, Silage, Cereal crops, Costs, Waste water treatment, *Oxidation lagoons.
Identifiers: *Dairy cattle, *Evaporative lagoon, Free stall housing, Milking parlor, Farrowing houses, Collecting yard.

The article describes the layout and features of a newly developed dairy operation for 200 cows. Features include three 120 feet long steel framed loafing barns and a 100,000 cu. ft. capacity evaporative lagoon. The solidified contents of the lagoon will be dug out by a contractor in summer. A 200 sow pig unit has also been established on this 500 acre Sussex farm. (White-Iowa State)
W71-07550

FARM WASTE DISPOSAL SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Engineering.
A. C. Dale.
Cooperative Extension Service, Purdue University, AE-80, Feb 1971. 10 p, 1 tab, 5 fig, 34 ref.

Descriptors: *Farm wastes, *Waste disposal, *Lagoons, *Oxidation lagoons, Aerobic conditions, Anaerobic conditions, Algae, Organic matter, Volume, Drying, Odor, Nitrogen, Aeration, Hogs, Cattle, Poultry, Research and development, Soil, Soil contamination.

Identifiers: *Disposal systems, *Land disposal, Oxidation ditches, Aerated lagoons, Composting, Refeeding, Anhydrous ammonia, Waste characterization.

In this publication the present available alternatives for animal waste disposal and criteria for selection of these methods are presented. A brief literature review tells of research being done in all areas and aspects of animal waste disposal. Land disposal still remains the most suitable and most widely used disposal method. Research indicates that approximately 250 pounds of nitrogen can be added to each acre of soil without unduly polluting it. Other methods of disposal discussed are aerobic, anaerobic, and mechanically aerated lagoons, as well as oxidation ditches, composting, and drying. Recommendations are made for the chemical treatment of animal wastes to reduce odors while spreading. (White-Iowa State)
W71-07551

AGRICULTURAL WASTE IN AN URBAN ENVIRONMENT.
New Jersey Animal Waste Disposal Task Force.

Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' Atlantic City, New Jersey, Sept 14-17, 1970. New Jersey Animal Waste Disposal Task Force. 256 p.

Descriptors: *Farm wastes, *Water pollution control, *Environment, Waste disposal, Cities, Grants, Research and development, Legislation, Communication, Poultry, Cattle, Odor, Lagoons, Aeration, Nitrogen, Moisture content, Aeration, Costs, Sewage, Agriculture, *Waste water treatment, Waste treatment.
Identifiers: *Urban environment, Land-Grant Colleges, Funding, Public relations, Refeeding, Land disposal, Research needs, Biological systems, Waste handling, Research funds, Recycling.

The groundwork for the conference 'Agricultural Waste in an Urban Environment,' was laid several years ago when the New Jersey Animal Waste Disposal Task Force was formed. Since its formation the Task Force has moved in four directions in an effort to find a solution to the agricultural waste problem. These have consisted of studying current laws, making maximum use of available methods of disposal, utilization and odor control, encouraging research, and informing the public of the issues. The conference was based on these four approaches. Various resources available to deal with the problem were brought together and, consequently the attitude of people of all levels of the economy, both rural and urban, was determined; additional resources were discovered; new interests were created; better communications were established; the latest technology was reviewed; and a plan of action was developed. A resolution passed by the delegates calls for a national conference on this matter by appropriate Federal officials. The main purpose of the conference was to find a way for rural and urban communities to develop their economies and reach their full potentials without becoming a nuisance to each other. (See also W71-07553 thru W71-07558) (White-Iowa State)
W71-07552

WASTE DISPOSAL AND POLLUTION, POULTRY PROCESSING,
Ralston Purina Co., St. Louis, Mo. Engineering Waste Disposal Plant.
Rowland Retrum.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 64-75, Sept 14-17, 1970. 13 tab, 5 fig.

Descriptors: *Farm waste, *Poultry, Water pollution, *Waste water disposal, Sewage, Odor, Biochemical oxygen demand, Organic matter, Annual costs, Aeration, Aerobic treatment, Anaerobic digestion, Lagoons, Dissolved oxygen, Condensers, Incineration, Drying.
Identifiers: *Poultry processing, Solids, Rendering plants, Odor control, Chemical scrubbing, By-products.

It is the author's intention to attempt to define the problem of waste disposal and pollution with respect to poultry processing, to describe efforts now being made toward solution, to review cost effects, and to indicate promixing directions for accelerated investigation. The problems considered as the major pollution problems are feather litter, water pollution, sewage treatment odors, and rendering odors. Costs and other data are computed for an 80,000 bird per day broiler processing plant with a small associated rendering plant. Suggestions are made for decreasing the total waste load while increasing income. Systems for reducing the odor from both sewage treatment and rendering plants are explained. The odor problem is complex and there are no pat solutions. Any solution will be expensive. (See also W71-07552) (White-Iowa State)
W71-07553

FUNDING FOR AGRICULTURAL WASTE RESEARCH,
Cornell Univ., Ithaca, N.Y.
N. C. Brady.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 89-98, Sept 14-17, 1970.

Descriptors: *Farm wastes, Research and development, Environment, Agriculture, Water pollution, Foods, Domestic wastes, Industrial wastes, Properties, Waste disposal, Grants, Population, Legislation, Education, *Costs.
Identifiers: *Research funds, Agricultural waste problem, Environmental quality, Intensive animal agriculture.

Three basic assumptions are made on which to establish a common ground. First the agricultural waste problem is serious. Secondly, agricultural waste problems are not extensions of those waste problems facing municipalities and industry. Thirdly, the solutions to the agricultural waste problem require knowledge that we do not now have. These assumptions lead to the fact that research and adequate funding are badly needed. The following are avenues that could be developed for solving agricultural waste problems in an urban environment: (1) Agriculture and its related industries must see environmental pollution as a major threat to themselves; (2) Agriculture should work closely with state and Federal legislators to obtain funding for direct application to State Experiment Stations and USDA research agencies; (3) Greater coordination between agencies is needed so that a larger proportion of the Federal Water Quality Administration's research funds can be used for animal waste studies; (4) We must not ignore the possibilities of reorienting research funds already available, and; (5) The training and education of professionals in agricultural waste management is needed. (See also W71-07552) (White-Iowa State)
W71-07554

DISPOSAL OF SOLID AGRICULTURAL WASTES - CONCEPTS AND PRINCIPLES,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Agricultural Engineering.
Raymond C. Loehr.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 126-134, Sept 14-17, 1970. 12 ref.

Descriptors: *Farm wastes, *Research and development, Waste disposal, Drying, Dehydration, Incineration, Beneficial use, Environment, Water pollution, Temperature, Moisture content, Odor, Feeds.
Identifiers: *Research needs, *Land disposal, Composting, Refeeding, Pyrolysis, Utilization, Waste management.

The state of development regarding suitable disposal methods for agricultural solid wastes is in an embryonic stage. A variety of techniques are possible but little information exists on the broad applicability of the techniques or on the detailed design and use parameter for the techniques with these wastes. Because of technical or economic difficulties, composting, drying and dehydration, incineration, and pyrolysis have not found wide application for animal solid wastes. Refeeding and land disposal offer the greatest opportunities for satisfactory disposal of animal wastes in the near future. The important research needs in the area of animal waste disposal include: (1) more thorough investigation of promising techniques, (2) utilization of non-traditional concepts, (3) evaluation of feasible disposal methods as part of animal production operations, (4) more and detailed cost information, and (5) broad interdisciplinary approaches and studies. (See also W71-07552) (White-Iowa State)
W71-07556

RECYCLING AND UTILIZATION OF BIODEGRADABLE WASTES IN THE SOIL,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Agricultural Engineering.
Charles H. Reed.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 135-139, Sept 14-17, 1970. 2 fig.

Descriptors: *Farm wastes, *Biodegradation, Waste disposal, Water pollution, Nitrogen, Nitrogen compounds, Nitrogen cycle, Research and development, Conservation, Soil, Environment, Agriculture.
Identifiers: *Recycling, Utilization, Biological systems, Materials balance.

The survival of man depends upon the intelligent use of agriculture with its inumerable physical, chemical and biological systems and cycles. The author emphasizes that all biodegradable organic wastes could and should be recycled and utilized by natural biological systems on specialized sites or farms. The ability of soils to filter and degrade organic wastes and immobilize potential pollutants is widely recognized. Plants are among the best known converters of nitrogenous compounds to non-pollutional materials. A figure depicts the nitrogen cycle and how organic wastes are recycled by the soil. A chart is presented showing a program for recycling biodegradable wastes. To achieve this objective an interdisciplinary approach must be taken, which will necessitate much research requiring many tax dollars. (See also W71-07552) (White-Iowa State)
W71-07557

AGRICULTURAL WASTE RESEARCH NEEDS,
Rutgers-The State Univ., New Brunswick, N.J. Dept. of Agricultural Economics.
George W. Luke.
Proceedings of the Conference, 'Agricultural Waste in an Urban Environment,' New Jersey Animal Waste Disposal Task Force, p 140-141, Sept 14-17, 1970.

Descriptors: *Farm wastes, *Environment, Water pollution, Grants, Population, Surveys, Waste disposal, Volume, Odor, Livestock, New Jersey.
Identifiers: *Waste handling, Masking agents, Environmental quality, Residential areas.

Aided by a grant from the State Department of Health, the Department of Agricultural Economics conducted a survey of livestock enterprises in four agricultural counties in New Jersey to determine the volume of waste, the methods of handling waste, the cost of waste disposal, the attitude of farmers toward the problem of animal waste, and the location of farms relative to residential areas. The results of this survey are given and evaluated. Between 600,000 and 1 million tons of waste are produced and disposed of in the four counties an-

nually. The typical method of disposal is on the land. Because the farms are small and confine only small numbers of animals, the threat to environmental quality is minimal. The closer to residential areas the more meticulous the farmers are in handling waste. Public agencies seeking to maintain environmental quality should consider educational programs emphasizing the most acceptable practices for the average size livestock farm. (See also W71-07552) (White-Iowa State)
W71-07558

RECYCLE WATER QUALITY FROM A BLAST FURNACE,
Carnegie-Mellon Univ., Pittsburgh, Pa. Mellon Inst. Water Resources.
Francis Clay McMichael, Edward D. Maruhnich, and William R. Samples.
Journal Water Pollution Control Federation, Vol 43, No 4, p 595-603, Apr 1971. 9 p, 7 fig.

Descriptors: *Water reuse, *Water pollution control, *Industrial wastes, Reclaimed water, Monitoring, Water quality, Water chemistry, Recirculated water.
Identifiers: *Blast furnace wastes.

Wet scrubbing of blast furnace flue gases resulted in a waste water containing dissolved organic and inorganic materials. To reduce the level of pollutant discharges, a portion of the clarifier overflow was recycled. Variations in gas wash water quality are related, at least partially, to furnace operation. Recycle gas-cleaning systems can be operated similarly to once-through systems, but the quality of the recycle water must be monitored to maintain calcium carbonate equilibrium. The dynamics of conservative tracers in recycle water can be easily modeled. Successful predictions of the time response of the cleaning system to changing levels of blowdown or make-up water can be made. (Knapp-USGS)
W71-07643

COOLING TOWERS,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05G.
W71-07645

WATER UTILIZATION AND WASTE CONTROL IN THE TEXTILE INDUSTRY,
North Carolina State Univ., Raleigh. School of Textiles.
Carl E. Bryan.
North Carolina Water Resources Research Institute, Raleigh, Nov 1969. 7 p, 1 tab. OWRR Project A-035-NC (1).

Descriptors: *Water reuse, Biochemical oxygen demand.
Identifiers: Textile mill wastes, Dyehouse wastes, Dyestuffs, *Warp sizes, Desizing, *Organic solvents, *Decolorizing.

This project was directed toward determining the principal sources of pollution in the textile industry, the effort made by the industry to control pollution and, from these, fruitful research problems in textile waste control. From surveys, plant-inspection trips, and discussions with representatives of industry, government and university, the following appeared to be areas in which important work can be done: (1) The recovery of warp sizes for reuse or for solid disposal from desizing wastes. (2) The elimination of color by decolorizing or by recovery for reuse or disposal from dye wastes. (3) The advanced treatment of wastes leading to water reuse. (4) The solvent processing of textiles in order to reduce disposal problems related to waste water. (5) It is advisable in every case before waste-treatment facilities are constructed to make in-plant survey of processes. A survey of the operations of a small textile plant led to the use of smaller amounts of chemicals in some cases and substitution of chemicals in others, both of which brought about a substantial reduction of BOD in the plant's effluent. (Bryan-North Carolina State Univ)
W71-07679

ELECTRODIALYSIS FOR DESALTING HAWAIIAN BRACKISH GROUNDWATER: A FIELD STUDY,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 03A.
W71-07681

5E. Ultimate Disposal of Wastes

GROUNDWATER POLLUTION FROM SANITARY LANDFILLS AND REFUSE DUMP GROUNDS, A CRITICAL REVIEW,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
A. E. Zanoni.
Wisconsin Department of Natural Resources, Research Report 69, 1971. 43 p, 8 tab, 62 ref.

Descriptors: *Landfills, *Water pollution, *Waste dumps, *Solid wastes, *Leaching, *Groundwater, Hydrogeology, Water pollution sources, Groundwater movement, Percolation, Water management, Impaired water quality, Waste disposal, Garbage dumps.
Identifiers: *Groundwater pollution, Landfill pollution effects.

A critical review is presented of the important literature covering the area of the groundwater pollution potential from sanitary landfills and dump grounds. This is followed by a review of the practices in twenty-one states in the U.S. related to this same topic. Based on the information derived from these two sources, a series of recommendations are suggested to regulatory agencies concerned with the task of approving and licensing solid waste disposal sites. It is emphasized that a regulatory agency should have available a geologist, ideally one trained in hydrogeology, to assist in sanitary landfill site selection processes. He should accumulate geological data and broadly outline areas considered as either good or poor potential landfill sites. Extreme caution should be exercised before approving ground disposal of industrial wastes. Monitoring wells should be used in cases where doubt exists as to the future effects of a particular landfill on groundwater supplies. The regulatory agency should follow a policy of slowing down the refuse degradation process by minimizing water percolation through refuse masses to provide for leachate attenuation. The regulatory agency should encourage regional or district approaches to solid wastes collection and disposal. As a rule, it should prohibit the use of abandoned rock, gravel or sand quarries as sites for refuse disposal. Regulatory agencies should support research in the area of ground water pollution. (Poertner)
W71-07194

DISPOSAL WELL PROBLEMS IN CHICAGO AND BAKERSFIELD AREAS,
Consoer, Townsend and Associates, Chicago, Ill.
Ralph G. Berk.
ASCE National Water Resources Engineering Meeting, Phoenix, Arizona, Jan 11-15, 1971. Meeting Preprint 1302. American Society of Civil Engineers, Jan 1971. 28 p, 3 fig, 5 ref. Price $0.50.

Descriptors: *Industrial wastes, *Water pollution control, *Waste disposal, *Injection wells, *Wells, *Liquid wastes, *Hydrogeology, Chemical wastes, Well casings, Drilling, Drilling equipment, Phenols, Brine disposal, Geological engineering, Geologic control, Geologic investigations, Groundwater, Aquifers.
Identifiers: *Waste disposal wells, Well drilling problems.

Methods used and problems encountered are described in drilling two deep injection wells intended for the disposal of industrial liquid wastes. One well was drilled to a depth of 2,629 feet in the Chicago, Illinois area for disposal of 1,200 barrels per day of highly alkaline brines and phenols having a specific gravity of 1.15. The other well was drilled in the vicinity of Bakersfield, California for the disposal of cannery waste liquid from the San Joaquin Valley canneries. This well was to be capable of accepting 18,000 barrels per day of caustics, chlorides, and relatively small amounts of hydrochloric acid and vegetable oils--along with 100 ppm of suspended solids, 4,000 to 10,000 ppm total dissolved solids, 300 to 13,000 ppm BOD and 100 to 48,000 ppm COD, with a pH of 10.0 plus. Use of a combination well casing and injection tubing in the form of Saran-lined steel pipe, although of greater initial cost than the standard design of steel oil-well casing and plastic injection tube, has off-setting physical and economic advantages. With the vugate fractured Devonian disposal zones in the Chicago disposal well, the vacuum produced in injecting the liquid waste would have collapsed the smaller diameter injection tube. (Poertner)
W71-07195

HYDROLOGIC IMPLICATIONS OF SOLID-WASTE DISPOSAL,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07238

NEW SEWAGE DISPOSAL SYSTEM AT TAHOE CITY.

Water and Sewage Works, Vol 118, No 1, p 6-8, Jan 1971.

Descriptors: *Sewage disposal, *Pumping plant, Water pollution, *Sewage effluent, Septic tanks, Pipelines, Sewage treatment, Springs, Percolation, California, Waste water treatment.
Identifiers: Tahoe City (Calif).

The 1968 California's law requiring the exportation of all sewage from the Lake Tahoe basin by January 1, 1972 inspired Tahoe City to come up with this imaginative disposal system. It utilizes three high speed pumps to lift the effluent 1400 ft. to the 'Cinder Cone' disposal area. This effluent is the outcome of a primary treatment plant which chlorinates and clarifies the sewage. The sludge cake is trucked 20 miles away and buried. The effluent flows to well compacted holding ponds and is then lifted to the 'sponge like', trench laced disposal area. Various studies were carried out and are still being conducted on the area and the draining springs. So far an increase of volume was detected with no adverse effects. (Rayyan-Texas)
W71-07368

HYDROLOGIC FACTORS AFFECTING THE UTILIZATION OF LAND FOR SANITARY LANDFILLS IN NORTHERN HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 07C.
W71-07638

SUMMARY OF INTERIM GUIDELINES FOR DISPOSAL OF SURPLUS OR WASTE PESTICIDES AND PESTICIDIE CONTAINERS.
Working Group on Pesticides, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07699

PROCEEDINGS OF THE NATIONAL WORKING CONFERENCE ON PESTICIDE DISPOSAL, AT NATIONAL AGRICULTURAL LIBRARY, BELSVILLE, MARYLAND, JUNE 30 and JULY 1, 1970.
Working Group on Pesticides, Washington, D.C.
For primary bibliographic entry see Field 05B.
W71-07700

GROUND DISPOSAL OF PESTICIDES: THE PROBLEM AND CRITERIA FOR GUIDELINES.
Working Group on Pesticides, Washington, D.C.

For primary bibliographic entry see Field 05B.
W71-07701

5F. Water Treatment and Quality Alteration

THE ROLE OF OXIDATION PONDS IN IMPROVING ENVIRONMENTAL HEALTH IN DEVELOPING COUNTRIES,
World Health Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 05D.
W71-07083

SURVIVAL OF ENTERIC BACTERIA AND VIRUSES IN MUNICIPAL SEWAGE LAGOONS,
New Hampshire Univ., Durham. Dept. of Microbiology.
For primary bibliographic entry see Field 05D.
W71-07094

BACTERIA REMOVAL IN OXIDATION PONDS,
Federal Water Quality Administration, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-07095

CHLORINATION OF WASTE POND EFFLUENTS,
Sacramento State Coll., Calif.
For primary bibliographic entry see Field 05D.
W71-07096

FUNDAMENTAL PRINCIPLES OF SEWAGE CHLORINATION,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05D.
W71-07132

EVALUATION OF ADVANCED TREATMENT PROCESSES FOR IMPROVING PLANT PERFORMANCE,
North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering; and North Carolina Univ., Chapel Hill. Sanitary Engineering and Water Resources Program.
For primary bibliographic entry see Field 05D.
W71-07352

HOW WE SOLVED OUR LIME SLUDGE DISPOSAL PROBLEM,
Water Department, Sioux Fall, S.D.
Paul V. Sanders.
Public Works, Vol 100, No 2, p 88-89, Feb 1969. 3 fig.

Descriptors: *Softening plant, Calcium carbonate, Lagoons, Sludge disposal, South Dakota, Water softening, Water treatment, Sludge treatment, Water works.
Identifiers: *Solids disposal method, Sioux Falls Water Department (SD).

The City of Sioux Falls required additional sludge drying bed capacity to handle 29 tons (dry weight) per day of calcium carbonate sludge. Since the expansion of existing facilities near to the softening plant was impossible, plans were made to pump the sludge 4550 ft to an elevation of 50 ft and provide gravity flow 1900 ft at a 5% grade. The waste generated during the construction of the lagoons that will provide 20 year storage is being disposed of in a nearby drainage ditch. Farmers and fertilizer companies are removing this material as needed. The sludge is pumped by a 4-inch Model D L Wemco pump in a 6-inch pressure line to low elevation areas at present. The line to the new facilities will be kept free by periodic flushing with a clean water service. The Water Department is working on new disposal applications for the sludge including uses as soil stabilizers, crop and pasture fertilizers, and soil sweeteners. (Nardozzi-AWWA)
W71-07459

ANN ARBOR'S RECALCINING PROCESS AND PROBLEMS,
Ann Arbor Utilities Department, Mich.
James C. Scott.
Journal American Water Works Association, Vol 61, No 6, p 285-288, June 1969. 3 fig.

Descriptors: Construction costs, Maintenance costs, Operating costs, *Sludge disposal, *Water treatment, *Wastes, Michigan, Water works, Water softening.
Identifiers: *Lime recalcining facility, Lime sludge, Ann Arbor (Mich).

Although a comprehensive report on Ann Arbor's water needs showed that the lagooning of lime sludge is an adequate disposal technique, the development of a lime recalcining facility was undertaken. The cost of the 24 ton per day lime reclamation facility is estimated at $1,200,000.00 including handling and treatment of the sludge from the clarifier to the finished lime storage tanks. The basic format is outlined of the process methodology from the lime sludge withdrawal to a lime product. The problems associated with this installation are those arising from personnel requirements, type of operation characteristics of sludge collected, winter equipment maintenance, and other equipment needs. The cost estimate is shown to be highly variable and a study of the proposed site and surroundings among other factors must be carefully evaluated. The problems are related to construction, maintenance, and operating costs. (Nardozzi-AWWA)
W71-07460

LAGOONING AND FREEZING FOR DISPOSAL OF WATER PLANT SLUDGE,
Metcalf and Eddy, Inc., Boston, Mass.
Stephen L. Bishop, and George P. Fulton.
Public Works, Vol 99, No 6, p 94-96, June 1968. 2 fig.

Descriptors: *Lagoons, *Freezing, Coagulation, *Water treatment, *Water works, Municipal water, New York, Sludge disposal, Sludge treatment, Wastes.
Identifiers: *Waste sludge storage, Gelatinous hydroxide sludge, Filter washwater, Shoremont Water Treatment Plant (NY).

The treatment of gelatinous hydroxide sludge and filter washwater from water filtration plants is a recognizable problem in pollution abatement. Alum recovery, vacuum filtration, and discharge of these wastes to sewerage systems are among some available treatment schemes. The advantages and disadvantages of these processes are discussed. Lagoons are shown to effectively settle and thicken sludges from the coagulation phase of the clarification process. Design parameters and sludge characteristics are given for the Shoremont Water Treatment Plant. In addition to providing waste sludge storage, the utility of lagoons for freezing the sludge as a treatment is discussed. The freezing process releases the water of hydration from hydroxide sludges and concentrates the sludge significantly upon thawing. This process is economical in climates where natural freezing could be used. At the Shoremont plant, the sludge concentration increased from 3.5 to 17.5% and the volume decreased considerably after freezing. Design considerations and operating procedures for lagoon-freezing operations are presented. (Nardozzi-AWWA)
W71-07461

ALUM RECOVERY FOR FILTRATION PLANT WASTE TREATMENT,
Metcalf and Eddy, New York.
George P. Fulton.
Water and Wastes Engineering, Vol 7, No 6, p 78-81, June 1970. 2 fig, 3 ref.

Descriptors: *Hydrogen ion concentration, *Filtration, Coagulation, Settling basins, *Water treatment, Water works, Wastes, Sludge treatment.
Identifiers: *Alum recovery, *Aluminum hydroxide sludge, *Acidulation, Thickener, Suspended solids.

Process considerations to be evaluated for alum recovery from an aluminum hydroxide sludge are described. The suspended solids content and other impurities contributing to the nature of the waste are examined with reference made to specific operating conditions and raw-water quality. The advantages of a preliminary thickener before the acidulation step are explained. A settling basin overflow rate of 250 gpd/ft sq and a pH of 2.0 is considered to enhance sludge settling in final solids separation. A 10-minute minimum detention time is suggested for the acidulation step. An alum solution between 1 and 2 % should be obtained for an efficient operation. Filtration plants in the 200 to 500 mgd range with raw water suspended solids at 20 mg/l indicate recovery costs to be $3 to $5 per million gallons water produced. The utility of alum recovery is cited. (Nardozzi-AWWA)
W71-07463

POLYELECTROLYTE CONDITIONING OF ALUM SLUDGES,
Quible and Associates, Chase City, Va.; and Virginia Polytechnic Inst., Blacksburg, Va.
Henry M. Bugg, Paul H. King, and Clifford W. Randall.
Journal American Water Works Association, Vol 62, No 12, p 792-795, Dec 1970. 6 fig, 1 tab, 6 ref. OWRR Project A-030-VA (1).

Descriptors: *Zeta potential, Dewatering, Water treatment, Wastes, Sludge treatment, Filtration, Metals.
Identifiers: *Polymer conditioning, *Specific resistance, Biological activity, Alum sludge, Jar tests, Nalco, Polyelectrolytes.

Data show that alum sludge is more amenable to dewatering by gravity drainage or vacuum filtration with polymer conditioning. Water plant wastes are potential pollutants containing metallic ions and organic material that deplete the oxygen resources of a watercourse while inhibiting natural biological activity. The polymers investigated were 2 cationic, 2 nonionic, and 3 anionic polyelectrolytes manufactured by Nalco. Jar tests showed that sludge-polmer mixing beyond 2 minutes caused a break up in the agglomerated floc. The cationic polymers were effective over a low pH band and the other polyelectrolytes were efficient in the pH 6.0 to 10.0 range. Anionic polymers performed best at the 2% sludge concentration and unadjusted pH of 6.6. Data are presented for the parameters of specific resistance and zeta potential for conditioned and unconditioned sludge. Bench-scale sand-bed drainage studies on a 4.2% alum sludge showed that conditioned material with 100mg/l of anionic polymer dewatered in one-fifth the time of unconditioned material. (Nardozzi-AWWA)
W71-07464

REVIEW OF SLUDGE DISPOSAL PRACTICES,
Corps of Engineers, Washington, D.C., Washington Aqueduct Div.
John W. Krasauskas.
Journal American Water Works Association, Vol 61, No 5, p 225-230, May 1969. 1 tab, 15 ref.

Descriptors: *Sludge disposal, Settling basin, Lagoons, Centrifugation, Sludge treatment, *Water treatment, Wastes, District of Columbia, Filtration, Water quality act, Legislation, Water works, Municipal water.
Identifiers: *Filter washwater, *Basin sludge, Sludge freezing, Filter press, Barging.

This review indicates that additional legislation will implement the Water Quality Act of 1965 and control the discharge of water treatment plant wastes to natural watercourses. The Washington Aqueduct Division conducted a survey of United States water treatment plants that showed that filter washwater and basin sludge were discharged

to surface waters in the majority of plants. A list of research centers and treatment facilities studying treatment processes is provided. The study shows that the sludge composition of water plant wastes are highly dependent upon the source water and the chemicals utilized for treatment. Reference is made to several sludge disposal methods. These methods include discharge to streams, storm sewers and sanitary sewers, settling in lagoons, sludge freezing, centrifugation, vacuum filtration, filter pressing, wedge wire filtration, sand drying beds, and barging. Some design parameters, equipment operating characteristics and cost data are given for actual installations. (Nardozzi-AWWA)
W71-07465

TREATMENT PLANT WASTE DISPOSAL IN VIRGINIA,
Virginia State Water Control Board, Richmond.
Earl R. Sutherland.
Journal American Water Works Association, Vol 61, No 4, p 186-189, Apr 1969. 2 tab, 11 ref.

Descriptors: *Sedimentation basin, *Filters, Lagoons, Recirculated water, Ultimate disposal, *Water treatment, Sludge, Virginia, Standards, Streams, Wastes.
Identifiers: *Filter washwater.

As part of a stream standards implementation program for the control of pollution caused by sewage, industrial, or other wastes, the Virginia State Water Control Board will provide specific provisions for the control of water treatment plant wastes. Four general water quality stream standards are provided. Water plant waste characteristics vary considerably with raw water quality, treatment processes, cyclic filter backwashing and sedimentation basin cleaning. Bacteriological problems were not significant, but waste solids concentrations and turbidity were extremely high. The advantages of waste lagooning, washwater recirculation, and sand bed drying are presented. Design parameters and operating and capital costs are referenced to waste water characteristics and plant capacity. Vacuum filtration, centrifugation, alum recovery, recalcining, and discharge to sewage treatment plants of water plant wastes are considered. The board's policy is expressed and the applicability of this policy is discussed for new and existing water plant facilities. (Nardozzi-AWWA)
W71-07466

DIATOMITE FILTRATION SLUDGE DISPOSAL.
American Water Works Association, New York.

Journal American Water Works Association, Vol 62, No 8, p 507-509, Aug 1970. 1 tab.

Descriptors: *Solid wastes, *Liquid wastes, Sludge disposal, Water treatment, *Filtration, *Diatomaceous earth, Separation techniques, Slurries.

The problem is considered of disposal of sludge from diatomite filtration operations with specific consideration given to potable water treatment. A table is presented comparing the characteristics of plant process wastes from diatomite filtration and conventional filtration plants. Several slurry disposal methods are discussed. Although a diatomite filtration slurry is stated to be a good soil conditioner for agricultural lands, the discolored waste material is esthetically objectionable. The advantages and disadvantages of disposing slurries to sewerage facilities are shown with consideration given to the abrasive and settling nature of the waste. Settling lagoons, vacuum drum filtration, and pressure bag filtration are suggested as solids separation techniques. Disposal of liquid wastes can be accomplished by discharge to sanitary sewers and recovery. Solid wastes will provide good landfill. A number of secondary waste uses are listed. (Nardozzi-AWWA)
W71-07467

RECLAMATION OF FILTER BACKWASH WATER,
Narvon Mining and Chemical Co., Lancaster, Pa.
W. Arthur Welch.
Water and Sewage Works, Vol 117, No 6, p 189-190, June 1970.

Descriptors: *Settling basins, *Lagoons, Pollution abatement, Sludge, Filtration, *Water treatment, Separation techniques.
Identifiers: *Washwater recovery, *Polyelectrolyte, Backwash cycle, Zeta Floc WA, Floc, Recovery basin.

In addition to the disposal of sludge from settling basins, the disposal of filter washwater is an important problem in water treatment plant pollution abatement. A polyelectrolyte, Zeta Floc WA, is stated to produce a dense floc when added to filter washwater during the backwash cycle. The coagulating chemical is fed dry to the waste water stream and is capable of producing an 80 to 85% washwater recovery when the waste is settled in lagoons or a recovery basin. Data for a typical backwash of 6 to 8 minutes with 60,000 gallons of water showed that 8 to 10 pounds of polyelectrolyte were required at a cost of $0.11 per pound. The sludge produced can be dewatered, recycled to the primary settling tanks, or utilized as a sewage sludge condition. (Nardozzi-AWWA)
W71-07468

THE NEW LANGFORD TREATMENT WORKS OF THE SOUTHEND WATERWORKS COMPANY.
Southend Waterworks Co.

Water and Water Engineering, Vol 74, No 894, p 319-327, Aug 1970. 12 fig, 1 tab.

Descriptors: *Construction, *Hydraulic design, Contracts, Chlorination, Hydrogen ion concentration, Filtration, *Water softening, Water works, Municipal water.
Identifiers: *Lime-soda softening, *Recycling, Prechlorination, Dechlorination.

The site, layout, foundation, administration, and plant specifications are described for a 12 million gallon per day lime/soda softening facility. In addition to the softening process, construction and hydraulic design considerations are outlined for the prechlorination, hydrogen ion concentration adjustment, gravity filtration, chlorination, and dechlorination processes. The lime/soda sludge is concentrated to 7000 gal/h and pumped at a rate of 3 1/2 feet per second through 4 inch PVC piping to a gravel pit. The sludge settles and the supernatant effluent from the pit is recycled to the plant intake line. Details are provided on the treated water pumping station and the architectural features of the utility. A history of the operating record of the Southend Waterworks Company is presented. A diagram of the water treatment processes and the site layout is included. (Nardozzi-AWWA)
W71-07469

THE ORLY WATERWORKS OF THE CITY OF PARIS.
Degremont, Rueil (France).
For primary bibliographic entry see Field 05D.
W71-07470

RECALCINING LIME SLUDGE PRODUCES MULTIPLE BENEFITS,
Water Department, St. Paul, Minn.
For primary bibliographic entry see Field 05D.
W71-07471

WATER TREATMENT PLANT WASTES DISPOSAL,
Orange County Sewer Districts, Orlando, Fla.
For primary bibliographic entry see Field 05D.
W71-07476

RESEARCH ON WATER TREATMENT PLANT WASTE DISPOSAL,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 05D.
W71-07477

DISPOSAL OF WASTE WATER FROM WATER FILTRATION PLANTS,
Metcalf and Eddy, New York.
For primary bibliographic entry see Field 05D.
W71-07478

WASTE ALUM AND ACTIVATED CARBON SLUDGE SOLIDS REDUCTIONS METHODS,
Orange County Sewer Districts, Orlando, Fla.
For primary bibliographic entry see Field 05D.
W71-07480

DRINKING OF SULFATE-WATER BY CATTLE,
Nevada Univ., Reno.
For primary bibliographic entry see Field 05C.
W71-07555

5G. Water Quality Control

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 06A.
W71-07134

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07161

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07211

GRANTS FOR WATER POLLUTION CONTROL.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07212

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07213

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07214

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.

Report of the Secretary of the Interior, Congress, S Doc No 91-58, 91st Cong, 2d Sess (1970). 633 p, 66 fig, 8 photo, 102 tab, 54 ref, 3 append.

Descriptors: *Estuaries, *Water pollution, *Water resources development, *Estuarine development, Gulfs, Oceans, Coasts, Bays, Rivers, Saline waterfresh water interfaces, Environmental effects, Environment, Federal government, Governments, Legislation, Social aspects, Legal aspects, Pollution

abatement, Water quality, Water pollution sources, Water pollution effects, Administrative agencies, Long-term planning, Estuarine fisheries, Federal-state water rights conflicts.

Pursuant to the Clean Water Restoration Act of 1966, the Secretary of the Interior herein presents a technical analysis of the estuarine zone, identification of scientific knowledge gaps, and an inventory of the available knowledge, all of which form the basis for the recommended comprehensive management program for the nation's estuarine resources. Included in the report are: (1) summary and conclusions of information leading to the recommended national program; (2) recommendations for a comprehensive program of estuarine development and management, including new legislation and suggested roles for government; (3) discussions with respect to technical management problems of the interaction between the biophysical and socioeconomic environment of the estuarine zone; (4) an evaluation of the institutional environment as it presently exists and recommendations for changes; (5) the development of data on the estuarine zone to provide the basis for sound technical management through rational institutional management; and (6) a description in general terms of the mass of reference materials from which the information in this report was derived. The active implementation of these recommendations will permit maximum use of the entire estuarine zone while preserving it for the benefit of future generations. (Smiljanich-Florida)
W71-07215

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07216

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
For primary bibliographic entry see Field 06E.
W71-07217

DISCHARGE OF OIL.
For primary bibliographic entry see Field 06E.
W71-07218

ENVIRONMENTAL EDUCATION ACT (NEED FOR EDUCATION CONCERNING ENVIRONMENTAL QUALITY AND ECOLOGICAL BALANCE).
For primary bibliographic entry see Field 06E.
W71-07219

LEGISLATION FACILITATING NEGOTIATION OF AN INTERSTATE COMPACT RESPECTING THE HUDSON RIVER.
For primary bibliographic entry see Field 06E.
W71-07220

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07221

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SYNTHETIC DETERGENTS).
For primary bibliographic entry see Field 06E.
W71-07223

A BILL TO ASSIST THE STATES IN ESTABLISHING COASTAL ZONE MANAGEMENT PLANS AND PROGRAMS.
For primary bibliographic entry see Field 06E.
W71-07224

TURNING POINTS IN TIME--LAND/WATER/PEOPLE.
For primary bibliographic entry see Field 03F.
W71-07294

PUBLIC HEARINGS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W71-07308

STANDARDS-SETTING CONFERENCES, HEARINGS, AND NOTIFICATION OF ALLEGED VIOLATORS OF WATER QUALITY STANDARDS.
For primary bibliographic entry see Field 06E.
W71-07354

SECOND SESSION OF THE CONFERENCE ON THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Federal Water Pollution Control Administration, Washington, D.C.

Proceedings of the Second session, Conference on Pollution of Lake Michigan and its tributary basin, Illinois, Indiana, Michigan, and Wisconsin, held Feb 25, 1969 at Chicago, Illinois. Vol 1: 364 p, 13 fig, 8 tab, 12 append; Vol 2: p 365-968, 1969. 20 fig, 14 tab.

Descriptors: *Conference, *Lake Michigan, *Water pollution sources, *Phosphorus, *Water pollution control, Tributaries, Municipal wastes, Industrial wastes, Waste treatment, Nuclear wastes, Thermal pollution, Ships, Chlorination, Dredging, Sediments, Soil erosion, Oil, Phenols, Electric powerplants, Insecticides, Agriculture, Flood plain zoning, Regulation, Monitoring, Harbors, Beaches, Watersheds (Basins), Pathogenic bacteria.
Identifiers: Watercraft wastes, Alewife, Oil spills.

The Second Session of the 1969 Conference on the Pollution of Lake Michigan heard representatives from the Corps of Engineers, Michigan, Indiana, Illinois, Wisconsin, Department of Agriculture, FWPCA, the 5th Army, and Navy on problems and solutions to water pollution, treatment, and elimination, including dredgings, disinfection, chlorine residues, municipal and industrial waste water treatment, soil erosion, flood plain control, economics, storm and waste water sewerage, diversion, interstate transportation of industrial wastes, federal-state concurrent jurisdiction, sampling, monitoring, watercraft and shipping wastes; pollution of marinas and beaches, law formulation and enforcement, shore disposal facilities, insecticides, interstate standards, programs for reducing sediment pollution and erosion damage. Also outlined were waste control and treatment in federal installations and shipboard disposal systems, uniform regulations on watercraft wastes, nuclear plant wastes, and thermal pollution standards, state water quality standards, utilization of thermal water, and alewife die-off. It was concluded that an average 80% reduction of phosphorus loadings into Lake Michigan can be achieved by 1972. (Auen-Wisconsin)
W71-07361

GENERAL MOTORS APPROACH TO WATER POLLUTION CONTROL,
General Motors Corp., Detroit, Mich.
G. N. Tiberio.
Proceedings, Industrial Waste Conference, 21st, Purdue University, Vol L, No 2, p 440-446, Mar 1966. 3 fig.

Descriptors: *Water pollution control, *Waste water treatment, *Cost analysis, *Industrial wastes, Oily wastes, Toxicity, Incineration, Vacuum drying, Dewatering, Coagulation, Flotation, Hydrogen ion concentration.
Identifiers: Management attitudes, Plating wastes, General Motors Corporation.

The full scope of water pollution control at the 150 General Motors facilities is discussed, with particular attention to the past history of pollution control practices in the GM administrations. At present, no plants are discharging any effluents which violate pollution control statutes. However, future plans have already been made for further developments. These include: (1) design, construction and maintenance of treatment facilities will be presented to plant managements as being of equal importance with manufacturing facilities; (2) pollution control should become an integral part of the total unit production cost; (3) water re-use and chemical recovery processes should be much more extensively explored to determine which process can be utilized; and (4) better methods for control and treatment of plating and oil waste sludges are imperative. At the present time, vacuum filtration, flotation, coagulation, and final clarification are used for oily wastes, while treatment of plating wastes involves many of the same processes in a different arrangement. (Lowry-Texas)
W71-07370

FILING OF REPORTS WITH SECRETARY OF THE INTERIOR BY PERSONS WHOSE ALLEGED ACTIVITIES RESULT IN DISCHARGES CAUSING OR CONTRIBUTING TO WATER POLLUTION,
For primary bibliographic entry see Field 06E.
W71-07421

AN OPTIMAL SITING MODEL FOR THERMAL PLANTS WITH TEMPERATURE CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
David H. Marks, and Richard A. Borenstein.
Available from Edison Electric Institute, 750 Third Avenue, New York, NY 10017 as EEI Pub No 70-902, Price $2.00. Cooling Water Studies for Edison Electric Institute, Research Project RP-49, Report No 6, Aug, 1970, Johns Hopkins University, Baltimore, Maryland.

Descriptors: *Thermal powerplants, Economics, Cooling water, Benefits, Costs, Area redevelopment, Input-output analysis, Project planning, Mathematical models, Temperature, Thermal pollution, *Optimization, Statistical models, Mathematical studies, *Optimum development plans, Sites, Temperature control, *Model studies.

Three models are presented for the optimal siting of thermal-electric generating stations. These models may be used as aids in making location decisions, particularly by showing the sensitivity of the models' optimal solution to changes in input parameters, and also by permitting the evaluation of costs associated with different siting policies and different temperature standards. The models presented are a zero-one integer programming model, a mixed integer programming model and a model with probabilistic temperature constraints. A working solution, type and format of input information, and a sample problem are presented. A general discussion of the economic aspects of an integrated power generating system and of questions relating to efficient utilization and growth of such a system is also presented. (Novotny-Vanderbilt)
W71-07423

PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION ACT, 1971.
For primary bibliographic entry see Field 06E.
W71-07434

EMERGENCY COMMUNITY FACILITIES ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07435

FLUX DEVELOPMENT REGION IN SUBMERGED JETS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W71-07436

COOLING TOWER FOG: CONTROL AND ABATEMENT,
International Nickel Co. of Canada Ltd., Sudbury (Ontario).
Hennie Veldhuizen, and Joe Ledbetter.
Journal of the Air Pollution Control Association, Vol 21, No 1, p 21-24, Jan 1971. 1 fig, 2 tab, 21 ref.

Descriptors: *Cooling towers, *Fog, Costs, Humidity, Water pollution control, *Pollution abatement, *Thermal pollution, Texas.
Identifiers: Control methods, Superheating, Plumes, Air cleaning, Houston (Tex).

Fogs from cooling towers are causing an increasing number of visibility problems in addition to icing of roads, sidewalks, powerlines, etc. during freezing weather. This paper summarizes a study made to ascertain the best method of fog control or abatement at a refinery in Houston, Texas. The induced draft, counterflow cooling towers of concern have design capacities of 750 million and 225 million Btu/hr under local climatic conditions. Wherever possible, preliminary capital, installation, and operating costs for all the alternatives were obtained and summarized in a table. The most economical solution for this particular problem is to unload the cooling tower for the estimated 150 hours a year either by disposing of or storing the hot water. Complete control by altering the heat exchange mechanism is possible but the costs are exorbitant. Dry towers which are being considered to prevent fogging, are very expensive. For new cooling towers, its location is recommended as a very important factor. (Upadhyaya-Vanderbilt)
W71-07437

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN--COMPACT.
For primary bibliographic entry see Field 06E.
W71-07440

SURVEY SHOWS NUCLEAR PLANTS WILL LIMIT POLLUTING EFFLUENTS,
Robert G. Schwieger.
Power, Vol 115, No 1, p 49-53, Jan 1971. 3 tab.

Descriptors: *Nuclear powerplants, *Thermal pollution, Cooling water, Cooling towers, Environmental effects, Water pollution control.
Identifiers: Heat dissipation, Heat utilization.

A summary is presented of the operational parameters of some 34 nuclear power plants in the United States and some 16 nuclear power plants overseas. Cooling parameters are determined with indication that the thermal effects study will be undertaken in 32 out of 34 cases in the United States. To limit the possibility of adverse effect on the environment, several utilities will have cooling towers or ponds; others will employ a variety of techniques for rapidly dispersing the heated effluent in the watercourse. Two ways to achieve good mixing are used: a perforated condenser discharge pipe extending well into a watercourse-like that at TVA's Brown Ferry-and a system of weirs to rapidly dilute warm effluent. While utilities find ways to dissipate heat, reactor vendors are looking into methods for using it beneficially to: (1) provide hot water for urban heating and absorption air conditioning systems and (2) to increase rate and effectiveness of sewage treatment processes. (Oleszkiewicz-Vanderbilt)
W71-07451

SUSQUEHANNA RIVER BASIN COMPACT.
For primary bibliographic entry see Field 06E.
W71-07453

A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF POLLUTION, DETERIORATION OF WATER QUALITY, AND DAMAGE TO LANDS AND WATERS RESULTING FROM EROSION TO THE ROADBEDS AND RIGHTS-OF-WAY OF EXISTING STATE, COUNTY, AND OTHER RURAL ROADS AND HIGHWAYS.
For primary bibliographic entry see Field 06E.
W71-07482

MARINE POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
For primary bibliographic entry see Field 06E.
W71-07483

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.
For primary bibliographic entry see Field 06E.
W71-07484

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FINANCIAL ASSISTANCE FOR RIVER BASIN PROGRAMS.
For primary bibliographic entry see Field 06E.
W71-07485

POLLUTION AND THE LAW IN ILLINOIS,
For primary bibliographic entry see Field 06E.
W71-07486

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
For primary bibliographic entry see Field 06E.
W71-07492

THE LAW OF WATER USAGE,
For primary bibliographic entry see Field 06E.
W71-07493

OIL POLLUTION OF COASTAL AND INLAND WATERS OF THE UNITED STATES UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
For primary bibliographic entry see Field 06E.
W71-07494

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
Allen V. Kneese.
Resources for the Future, Inc, Washington, DC, Reprint No 88, August 1970. 8 p, 1 ref.

Descriptors: *Water pollution control, *Environmental sanitation, *Economic efficiency, *Federal project policy, Federal government, Effluents, Economic feasibility, Economic justification, Economics, Natural resources, Environmental engineering, Grants, Taxes, Water quality control, Water pollution treatment, Administration, Regional analysis, Legal aspects, Cost allocation, Coordination, Political constraints, Legislation, Interstate commissions, Interstate compacts, Nonstructural alternatives.
Identifiers: *Effluent charges, Federal Water Pollution Control Act.

This reprint of a statement before the House Subcommittee of the Committee on Government Operations examines environmental pollution problems from an economic perspective, and outlines a proposed water pollution control strategy. The inadequacy of governmental subsidies and technological fixes increases the importance of managing the environment in terms of 'common property resources'. The author rejects existing federal water pollution control strategy based on municipal waste treatment grants under the Water Pollution Control Act of 1956 and state water quality standards, imposed by the Water Pollution Control Act of 1965. The inadequacy of this strategy stems from: (1) lagging appropriations, (2) ineffective enforcement, and (3) poor coordination. Industrial tax incentives are also rejected as economically ineffective. An effluent charges system, coupled with regional management, is economically superior to other plans because: (1) effluent charges require payment for resource use, (2) subsidies provide no inherent incentives, (3) subsidies bias technique selection, and (4) effluent charges produce revenue. A national effluent charge would avoid local political pressures. Federal leadership establishing interstate management appears more practical than direct federal administration as a means of obtaining regional management efficiency. (Earl-Florida)
W71-07495

ECONOMIC ANALYSIS OF SEWER SERVICE CHARGE FORMULAS,
McMasters Univ., Hamilton (Ontario). Dept. of Economics.
For primary bibliographic entry see Field 06C.
W71-07502

FINAL REPORT OF THE TECHNICAL COMMITTEE ON STORM OVERFLOWS AND THE DISPOSAL OF STORM SEWAGE,
J. T. Calvert.
Inst Civil Engrs (London), Vol 47, p 305-308, Oct 1970.

Descriptors: *Sewage disposal, Costs, Water pollution sources, Sewers.
Identifiers: *Storm overflows, Great Britain.

An informal discussion on the Committee's findings shows that: (1) the abolition of all storm overflows was not recommended because the enormous cost could not be justified and pollution from surface water sewers could still occur; and (2) a new formula, in which the amount of sewage to be contained in the system downstream of the overflow would vary only slightly with water consumption and the formula would broadly ensure the polluting matter from each person was diluted by a fixed amount of rainwater before spill commenced, were recommended.
W71-07519

COMBINED SEWER REGULATOR OVERFLOW FACILITIES.
American Public Works Association, Chicago, Ill.

FWQA Contract No 14-12-456, Program No 11022DMU, Jul 1970. 139 p, 38 tab, 4 append.

Descriptors: *Overflow, *Regulation, Design, Operations, Maintenance, Control systems.
Identifiers: *Combined sewers, Tide gates, Overflow quantity, Overflow quality.

Current design, operation, and maintenance practices used by local jurisdications in the United States and Canada were determined by personal interviews and compiled in this report. Particular attention was given to the performance of various types of regulators, the use of tide gates, new designs, European practices, and the systems concept of combined sewer regulation. Thirty-seven drawings and photographs of regulators are included. 17 recommendations are made, the adoption of which would upgrade regulator facilities and tend to reduce receiving water pollution from combined sewer overflows.
W71-07520

METROPOLITAN BOSTON'S WASTE WATER QUALITY CONTROL PROGRAM.

Water Sewage Works, Vol 117, No 9, p 300-304, Sep 1970.

Descriptors: *Water pollution sources, *Overflow, *Legislation, *Treatment facilities, Pollution abatement, Water quality control, Massachusetts.
Identifiers: *Storm overflows, *Boston (Mass).

This paper traces the historical factors contributing to the sewage problems in Boston, Massachusetts and accredits the general causes for the pollution conditions to: (1) the raw sewage discharge into Boston Harbor, and (2) mixed sewage and storm water overflow into tributary rivers, streams, and basins. Pertinent sections of legislation authorizing pollution control construction as well as associated legislative acts are mentioned. A description of existing sewage treatment plants and important features of the improvement programs is given. A new anti-pollution installation on the Charles River, expected to be undergoing acceptance and evaluation tests in late 1970, will accumulate, detain, and chlorinate overflow from combined sewage and surface drainage occurring during heavy storms.
W71-07521

THE CARDIFF EASTERN DISTRICT DRAINAGE SCHEME,
S. R. Salt.
Inst Munic Engrs, London, Vol 97, No 9, p 246-254, Sept 1970. 8 fig, 2 ref.

Descriptors: *Sewerage, *Sewers, *Planning, *Drainage systems, Treatment facilities.
Identifiers: *Great Britain.

The area around Cardiff, Wales is serviced by three sewerage systems which have continued in use from the latter half of the 19th century until recently, with only one major change, despite expansion of the city. It was clear that a major renewal was required if further development on the east side of the city was not curtailed. The new plans would: (1) eliminate three storm overflows, (2) ensure far off-shore discharge, (3) provide for the screening of the total flow, and (4) maintain existing sewers. Thus the scheme, which is detailed herein, would include two runs of duplication sewers, a new pumping station, and a new sea outfall.
W71-07526

EFFECT OF RAIN COLLECTING BASINS ON THE YEARLY INFLUX OF POLLUTANTS INTO A SEWER MAIN: FUNDAMENTALS OF DIMENSIONING COLLECTING BASINS,
Walter Munz.
Gas-Wasserfach, Vol 109, No 30, p 823-827, July 26, 1968. 4 fig, 1 tab, 8 ref.

Descriptors: *Sewers, *Infiltration, *Water pollution sources, Mathematical studies.
Identifiers: *Collecting basins.

The International Water Protection Commission for Lake Constance was faced with the question of the magnitude of the effect of an individual measure on the yearly influx of pollutants into the sewer main. To provide an answer, the author worked out a procedure for computations of material flows for different combinations of measures of differing effectiveness under given conditions. Such computations were carried out at the Zurich Technical University and the Baden-Wurttemberg Hydrological Administration. The results of the computations relating to the elimination of BOD by various combinations of pertinent measures are presented in graphs and briefly discussed. The author also presents a systematic classification of all possible kinds of rain collecting basins according to basin type and the relative altitude of the basin outlet with respect to its inlet.
W71-07527

STORM-WATER RETENTION CAN WORK...AND PREVENT THE HEAVILY POLLUTED 'FIRST FLUSH' FROM OVERFLOWING TO DAMAGE THE RECEIVING RIVER,
Gerald Remus.
Am City, Vol 85, No 10, p 68-69, Oct 1970. 2 fig.

Descriptors: *Storm runoff, *Sewers, *Monitoring, *Control systems, Sewerage, Data collections, Michigan, Waste water treatment, Water pollution control.
Identifiers: *Detroit (Mich), *Overflow abatement.

An intense thunderstorm over Detroit, Michigan dropped about one billion gallons of water with about 450 million gallons entering the sewer system that processed 365 million gallons in excess of average flow during the following 30 hours. The system retained so much storm water that the overflow outfalls, which normally discharge into the Detroit and Route Rivers, had very little to do. The sewer monitoring and remote control system, briefly discussed, efficiently compiled rainfall and sewer-level data every five minutes.
W71-07530

PRECAST, REINFORCED CONCRETE MEMBERS IN THE CONSTRUCTION OF WATER SUPPLY AND SEWERAGE SYSTEMS,
V. I. Lerner, and I. S. Chumakov.
Beton i Zhelezobeton, No 2, p 8-10, Feb 1970.

Descriptors: *Construction materials, *Concrete construction, Sewerage, Water pollution control.
Identifiers: *Water supply systems, *Sewerage systems, *USSR.

The construction of sewers and water supply tunnels made of large dimensional and relatively thin-walled reinforced concrete components has been experimented with by the Soviets. The methods of construction of reinforced concrete waterproof wall panels for rectangular and round vessels are discussed.
W71-07537

PHOTOGRAPHY AND OTHER REMOTE SENSING OF WATER POLLUTION,
R. K. Lane.
Water Pollution Control, Vol 108, No 9, p 20-21, Sept 1970.

Descriptors: *Photography, *Data collections, *Remote sensing, Effluents, Pollutants.
Identifiers: Water pollution studies.

Photography has long been used as a remote sensing tool for environmental data collection from aircraft. In water pollution studies most interest is centered around the need for observing the behavior of effluents which introduce pollutants to rivers or lakes. Qualitative examinations of effluents through photography can be useful to locate effluents, to determine how their behavior is affected by local characteristics, ambient flow rates, and meteorological conditions, and to determine relative intensities of discharges. Techniques for quantitative assessments of polluted discharges are not yet operationally effective.
W71-07538

ANIMAL WASTE REUSE--NUTRITIVE VALUE AND POTENTIAL PROBLEMS FROM FEED ADDITIVES--A REVIEW.
Agricultural Research Service, Beltsville, Md. Animal Science Research.

ARS 44-244, Feb 1971. 56 p, 3 tab, 184 ref.

Descriptors: *Farm wastes, *Additives, *Feeds, Ruminants, Poultry, Cattle, Diets, Hazards, Hogs, Biodegradation, Pathogenic bacteria, Larvicides, Pest control, Organophosphorus, Nutrients.
Identifiers: *Literature review, *Residues, Swine, Hormones, Antibiotics, Disease control, Growth adjuvants, Excretion data, Registration, Non-nutritive.

This is a report of literature on the nutritional value of animal wastes and the potential problems that may occur when compounds other than nutrients are added to animal feed. The non-nutritive feed additives discussed are as follows: Pellet binders, flavoring agents, enzymes; Antibiotics, arsenicals, nitrofurans, (low level feeding); Antifungals, larvicides; Broad-spectrum, absorbable antibiotics (high level therapeutic use); Chemicals used to potentiate curative properties of antibiotics; Coccidiostats, worming drugs, antioxidants; Carotenoid sources, hormones; Reserpine, aspirin, and tranquilizing drugs. (See also W71-07543 thru W71-07547) (White-Iowa State)
W71-07542

FECAL RESIDUES FROM FEED ADDITIVES--POULTRY,
Agricultural Research Service, Beltsville, Md. Animal Science Research.
C. C. Calvert.
In: Animal Waste Reuse--Nutritive Value and Potential Problems from Feed Additives--A Review. ARS 44-224, p 14-19, Feb 1971.

Descriptors: *Additives, *Feeds, *Poultry, Farm wastes, Pollutants, Diets, Hazards, Water pollution.
Identifiers: Antibiotics, Arsenicals, Nitrofurans, Growth adjuvants, Soil pollution.

To keep pace with the increased demand for eggs and poultry meat, the feed manufacturers and producers have used more and more feed additives. There is a concern with what these additives may contribute to air, soil, and water pollution after they have performed whatever function they may have in the animal body. The nonnutritive feed additives commonly found in poultry feed are discussed. These include pellet binders, flavoring agents, enzymes, antibiotics, arsenicals, and nitrofurans; antifungal agents, coccidiostats and worming drugs, antioxidants, carotenoid sources, hormones, reserpine, aspirin and tranquilizing drugs are being added to poultry feeds. (See also W71-07542) (Christenbury-Iowa State)
W71-07543

FEEDING VALUE OF ANIMAL WASTES,
Agricultural Research Service, Beltsville, Md. Animal Science Research.
L. W. Smith.
In: Animal Waste Reuse--Nutritive Value and Potential Problems from Feed Additives--A Review. ARS 44-224, p 5-13, Feb 1971. 1 tab.

Descriptors: *Feeds, *Ruminants, Algae, Cattle, Poultry, Hogs, Animal diseases, Catfish, Waste treatment, Farm wastes, Dehydration, Feasibility.
Identifiers: *Animal manure, *Literature review, Feeding value.

This paper reviews the literature concerned with feeding animal waste to livestock. Fiber in diets for ruminants is not digested to the maximum possible extent during the initial pass through the digestive tract. Other nutrients also escape digestion. Feeding feces is not a new concept. Early in the 1940's cow manure was looked upon as a source of B-complex vitamins. Poultry and catfish have been successfully fed rations containing feedlot manure. There have been many articles concerning the use of poultry litter in ruminant feeding programs. Feeding poultry feces to poultry was reported to have no adverse effect on bird mortality or egg taste. Algae grown on sewage has been fed to rats. The authors indicate that algae is a potentially valuable livestock feed. (See also W71-07542) (Christenbury-Iowa State)
W71-07544

FECAL RESIDUES FROM FEED ADDITIVES--SWINE,
Agricultural Research Service, Beltsville, Md. Animal Science Research.
L. T. Frobish.
In: Animal Waste Reuse--Nutritive Value and Potential Problems from Feed Additives--A Review. ARS 44-224, p 19-27, Feb 1971.

Descriptors: *Additives, *Hogs, *Feeds, Farm wastes, Hazards, Pollutants, Growth rates, Diets.
Identifiers: Swine, Diethylstilbestrol.

This paper discusses the major feed additives associated with swine production. They are: antibiotics, arsenicals, copper, nitrofurans, sulfonamides and hormones. Many compounds have been used for the treatment of specific diseases in swine but when incorporated into the diet at low levels may have growth promoting properties. There is little available information on the metabolites of antibiotic degradation, their excretion, and possible distribution in the soil and finally into plants. Arsanilic acid is the most common arsenical compound used in swine diets. There is very limited data on excretion of many of the additives and their subsequent effect on the environment. (See also W71-07542) (Christenbury-Iowa State)
W71-07545

FECAL RESIDUES FROM HORMONES AND ANTIBIOTICS--BEEF CATTLE,
Agricultural Research Service, Beltsville, Md. Animal Science Research.
D. A. Dinius.
In: Animal Waste Reuse--Nutritive Value and Potential Problems from Feed Additives--A Review. ARS 44-224, p 27-32, Feb 1971.

Descriptors: Farm wastes, Cattle, Feeds, Diets, Degradation (Decomposition), Biodegradation.
Identifiers: *Hormones, *Antibiotics, Disease control, Concentrations, Implant, Excretion data.

The interest in hormones excreted by animals which may be recycled through plants and back to man or animals is with the natural and synthetic estrogens, androgens, and progestins. This discussion deals only with these. Other hormones, such as follicle stimulating hormone and luteinizing hormone, may be present in animal excreta but they occur in small concentrations and are readily biodegradable; thus, they are of little ecological concern. Certain antibiotics are frequently added to the high-grain ratios commonly fed to finishing beef cattle. A review summarizing some of the research that has been conducted with these antibiotics, particularly in reference to the potential for recycling through feedstuffs is presented. Plants will not absorb from the soil measurable quantities of the antibiotics commonly fed to cattle. (See also W71-07542) (Christenbury-Iowa State)
W71-07546

FECAL RESIDUES FROM LARVICIDES--POULTRY AND CATTLE,
Agricultural Research Service, Beltsville, Md. Animal Science Research.
R. W. Miller.
Also in Bulletin of the Entomological Society of America as Larvicides for Fly Control - A Review, by R. W. Miller, Vol 16, No 3, p 154-158, Sept 1970. In: Animal Waste Reuse--Nutritive Value and Potential Problems from Feed Additives--A Review. ARS 44-224, p 33-41, Feb 1971. 2 tab.

Descriptors: *Farm wastes, *Larvicides, Larvae, Pathogenic bacteria, Boron, Organophosphorus, Pesticides, Cattle, Poultry, Feeds, Pesticide residues, Pest control.
Identifiers: Fly larvae, Feed additives, Residues, Fly control, Animal manures, Registration.

One of the best methods for control of flies is through the use of larvicides, applied either directly to the manure, or as a feed additive. Research was conducted as early as 1928 on feed additives to make the feces unfavorable for the development of horn fly larvae. In 1954, organophosphorus insecticides began receiving a great deal of attention as possible feed-additive larvicides for the control of flies around both poultry and cattle operations. Although a great deal of research has been conducted on find suitable feed-additive larvicides for fly control around poultry and cattle manure, no insecticides are registered for commercial feed-additive use with poultry and only one has a registration for use with lactating dairy cattle. Three insecticides have registrations for feed-additive use with beef cattle. (See also W71-07542) (Christenbury-Iowa State)
W71-07547

AGRICULTURAL WASTE IN AN URBAN ENVIRONMENT,
New Jersey Animal Waste Disposal Task Force.
For primary bibliographic entry see Field 05D.
W71-07552

RIVER BASIN AUTHORITIES: A NATIONAL SOLUTION TO WATER POLLUTION,
Harvard Univ., Cambridge, Mass.
Marc J. Roberts.
Harvard Law Review, Vol 83, p 1527-1556, May 1970.

Descriptors: *Water pollution control, River basin commission, Pollution abatement, Waste treatment facility, Economic efficiency, Resource allocation, Streamflow, Investment credit.
Identifiers: *Effluent charge, Subsidy, Equity, Social cost, Tax incentive.

Some reforms suggested for water pollution control are analyzed and a new approach to water pollution abatement is proposed. The most prevalent suggestion to stimulate private pollution control investment has been the use of tax incentives usually through accelerated depreciation or some form of investment credit. The author finds that proposed tax incentives are too small to generate much business response and moreover tend to shift funds away from least-social-cost approaches such as chemical treatment or land-intensive procedures. Finally, industrial incentives or subsidized municipal treatment of industrial wastes shifts the cost of pollution to the government with resulting economic misallocations. The author suggests the formation of strategically located federal river basin authorities to control and conduct all pollution abatement activity. With federal funding for treatment of domestic wastes and efficient service charges for treating industrial effluent, the basin authority is an equitable and efficient method of meeting water quality standards. (Siegenthaler-Rutgers)
W71-07559

A THREE STEP APPROACH TO POLLUTION REVERSAL,
Oregon Univ., Eugene.
For primary bibliographic entry see Field 06B.
W71-07563

WATER QUALITY CONTROL PRACTICES ON THE GREAT LAKES,
Ontario Water Resources Commission, Toronto.
J. R. Barr, and A. C. Priatz, Jr.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Power Commission of Ontario, p 393-417, 1968.

Descriptors: *Great Lakes, *Water quality, *Pollution, *Water resource development, Waste treatment, Water management, River basins, Sewage, Watersheds, Lakes, Government, Capital costs, Financing, Planning, Sewers, Pesticides.
Identifiers: *Education, *Water Quality standards, Bond financing.

Water quality control practices on the Great Lakes are considered in two sections, namely the Canadian and United States practices. The Canadian section indicates that historical water quality control practices point to a need for new objectives to insure the long-term water quality of the Great Lakes. However, it is then indicated that such new actions, particularly pollution control, call for mass education of municipalities, industry and the public for financial program support of activities which do not yield an immediate self-benefit. The American section, on the other hand, indicates that water quality control practices are constantly undergoing improvement in response to concern on the part of the public in favor of a preventive approach to pollution. The author also cites improved co-ordination between responsible branches of government as another recent trend in water quality control, particularly as seen in the uniform laws of the Water Quality Standards Programme and Statewide treatment of waste and water management. Such current trends are presented as indications that water resources will be optimally preserved for future use. (See also W71-07565) (Murphy-Rutgers)
W71-07575

ORGANIZATION AND PLANNING OF WATER QUALITY CONTROL,
Ontario Water Resources Commission, Toronto.
For primary bibliographic entry see Field 06B.
W71-07576

EFFLUENT CHARGES: A METHOD OF ENFORCING STREAM STANDARDS,
Maine Univ., Orono.
For primary bibliographic entry see Field 06C.
W71-07577

SOURCE CONTROL OF URBAN WATER POLLUTION,
Florida Univ., Gainesville. Dept of Engineering and American Public Works Association, Chicago, Ill. Technical Services.
James P. Heaney, and Richard H. Sullivan.
Journal Water Pollution Control Federation, Vol 43, No 4, p 571-579, Apr 1971. 9 p, 1 fig, 9 tab, 14 ref.

Descriptors: *Water pollution sources, *Cities, *Urbanization, *Storm runoff, *Water pollution control, Water pollution effects, Pollutant identification, Illinois, Runoff, Storm drains, Sewage, Sewers, Water quality, Water management (Applied).
Identifiers: *Urban runoff, *Urban hydrology.

An exploratory study was undertaken to obtain a 'solids budget' of urban runoff within a 10-acre area in Chicago, Ill. The sources investigated included air pollution, sanitary wastes, garbage, and miscellaneous solids. The source controls examined were catch basin cleaning, sewer cleaning, and street sweeping. Unit costs of street sweeping indicate that catch basins and their cleaning, along with subsequent sewer cleaning, make them undesirable. Garbage grinders are also a likely possibility for reduced use or outlawing. (Knapp-USGS)
W71-07642

POLLUTION CONTROL AT A MAJOR OIL SPILL,
Union Oil Co. of California, Los Angeles.
T. H. Gaines.
Journal Water Pollution Control Federation, Vol 43, No 4, p 651-667, Apr 1971. 17 p, 1 fig, 1 tab, 1 ref, 4 append.

Descriptors: *Water pollution control, *Oily water, *Oil fields, *California, *Water pollution treatment, Reviews, Water pollution effects, Cleaning.
Identifiers: *Oil spills, *Santa Barbara (Calif).

The paper is a comprehensive report on the efforts made to limit the pollution effects of the Santa Barbara oil spill of January 28, 1969. The use of polyelectrolytes and dispersants is reviewed. Application techniques and their effectiveness are discussed. The role of the Federal Water Quality Administration in the occurrence is included. Containment of the oil side with a boom was unsuccessful. An attempt was made to use booms to protect the shoreline, but heavy seas prevented their use. After the beaches were inundated with oil, cleanup efforts were started with a peak labor force of 1,000 men. Over 30,000 tons (27,000 metric tons) of storm debris were cleaned up. A system of containment for undersea seepage is described. A complete equipment list and progress report is included in the paper. (Knapp-USGS)
W71-07644

COOLING TOWERS,
Black and Veatch, Kansas City, Mo.
Riley D. Woodson.

Scientific American, Vol 224, No 5, p 70-78, May 1971. 9 p, 8 fig, 1 tab.

Descriptors: *Cooling towers, *Cooling water, *Industrial water, *Engineering structures, *Heated water, Thermal pollution, Structures, Structural design, Construction, Reviews, Cooling, Heat transfer, Recirculated water, Methodology.

Hot water carrying waste heat from a large industrial installation such as a powerplant is often best handled by a tower that breaks the water up, cools it in a cross draft of air and then recirculates it. Four types of towers are depicted schematically. 1. The atmospheric tower, which was one of the earliest types of cooling tower, relied on natural winds and the aspirating effect of the spray nozzles to provide cooling air. 2. The mechanical-draft crossflow tower, which is the kind in widest use at present, has a fan at the top to draw air in through the louvers, across the path of the falling water and out of the stack. 'Fill' is the material that breaks up water into fine droplets; the drift eliminators retard the movement of water out of the stack with the departing air. 3. The mechanical-draft counterflow tower is similar except that the air moves vertically upward through the falling water. 4. The hyperbolic natural-draft tower has no fan; the draft results both from the height of the structure and the difference in density between the warm, moist air inside the tower and the colder, denser air outside. Discharge is far above ground. (Woodard-USGS)
W71-07645

IMPROVED METHODS FOR PLANNING OF THERMAL DISCHARGES BEFORE SITE ACQUISITION,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Lab.
R. T. Jaske.
Atomic Energy Commission Research and Development Report, BNWL-SA-2737 17 p, Dec 1969. 6 fig, 9 ref.

Descriptors: *Thermal pollution, *Water temperature, *Powerplants, Model studies, Water quality, Standards, Optimization, *Sites, Water pollution control.
Identifiers: *COLHEAT simulation model, Thermal discharge.

The most significant factors for site selection of a powerplant are thermal effluent considerations, existing transmission system, plant size, environmental impact, and consumer requirements. To relate steam temperature modification with optimum public utilization Battelle Northwest developed COLHEAT, a deterministic one-dimensional temperature prediction system. This system describes the thermal regimen of a river or estuary and permits advance estimates of thermal effects of impoundments, single thermal plants or an extended series of thermal and hydro installations with overlapping effects on a single or regionally combined watershed. This paper reviews the basic algorithm employed and the rationale behind this approach. It is concluded that simulation modelling is fully capable of handling most of the potential siting problems which involve joint public and private use of thermal cooling resources. (Upadhyaya-Vanderbilt)
W71-07668

SHELL FIRE DYING PEACEFULLY,
Shell Oil Co.
Ken Edmiston.
Ocean Industry, Vol 6, No 3, Mar 1971.

Descriptors: *Oil wells, *Leakage, *Burning, *Chemicals, *Absorption, Oily water, Oil wastes.
Identifiers: Bay Marchand field blowout.

Containment and cleanup operations at Shell's field blowout in Marchand Bay are reported. Relief wells and various kinds of floating vessels, booms, chemicals and absorbents were used successfully in spite of the high seas, fog and prolonged southern winds. Casing cutting, killing the wells and the equipment used in all the operations are described in detail. (Ensign-PAI)
W71-07669

A SURVEY OF THE PROBLEMS AND RESEARCH NEEDS IN THE COASTAL ZONE,
Old Dominion Univ. Research Foundation, Norfolk, Va.
For primary bibliographic entry see Field 02L.
W71-07673

WATER RESOURCES ACTIVITIES IN THE UNITED STATES-POLLUTION ABATEMENT.
For primary bibliographic entry see Field 06E.
W71-07674

DETOXICATION OF SIMAZINE BY MICROSCOPIC ALGAE,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Selskokhozyaistvennoi Mikrobiologii, Leningrad.
Yu V. Kruglov, and L. N. Paromenskaya.
Trans from Mikrobiologiya, Vol 39, No 1, Jan-Feb 1970. Microbiology, Vol 39, No 1, p 139-142, 1970. 1 fig, 2 tab, 10 ref.

Descriptors: *Herbicides, *Pesticides, *Algae, *Toxicity, Soils, Triagine pesticides, Resistance, Cultures, Metabolism.
Identifiers: *Simazine, *Detoxication, Chlorosarcina, Ankistrodesmus braunii, Chlorella vulgaris.

Inoculation of simazine-treated soils with a culture of Chlorosarcina sp suggested a decrease in toxicity of the herbicide, the process being partly influenced by direct solar radiation. The chemical absorbed by Chlorosarcina and Ankistrodesmus braunii was partly metabolized by cells and formed some physiocochemical bond with protein. As shown by C-14 analyses, the strength and nature of this bond vary with the species of algae. Cells of Chlorosarcina, resistant to simazine, retained considerably greater amount of the chemical than did the cells of Ankistrodesmus, sensitive to the herbicide. (Wilde-Wisconsin)
W71-07675

REMOVAL OF COLOR FROM THE WATER OF WAIKOLOA STREAM SOUTH KOHALA DISTRICT, ISLAND OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 05A.
W71-07680

THE USE OF TAXES, SUBSIDIES, AND REGULATIONS TO EFFECT AN IMPROVED ALLOCATION OF WATER RESOURCES,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 06E.
W71-07686

THE SANITARY HISTORY OF CHICAGO,
Henry W. Thurston.
Chicago, Circa 1899-1903. 50 p.

Descriptors: *Water pollution effects, *Diseases, *Epidemics, *Mortality, *Water quality, *Municipal wastes, *Municipal water, *History, *Public health, *Environmental sanitation, *Sewers, *Inspection.
Identifiers: *Chicago, *Sanitary history of Chicago, *Chicago Board of Health.

The author discusses the health problems and diseases prevalent in the City of Chicago from the 1830's to 1900 and relates these to public ignorance of, and unconcern for, sanitation. The average life-span of a Chicagoan in 1872 was 15 years, 2 mos., 10 days. Of 1,826 Chicagoans who died in 1859, 1,070, almost 57%, were under five years old. The high death rates of certain years were associated with epidemics of cholera, smallpox, diptheria, typhoid, erysipelas, scarlet fever, dysentery, and others. A Board of Health, consisting of three members, was provided for by the charter when Chicago became a city in 1837. The erratic operation and existence of the Board is discussed. The total expenditures of the Board in 1851 were $2,131.52, including salaries. The development of a sewer system and a water system, together with filling low-lying areas to raise the ground elevation to facilitate gravity flow of sewers, is discussed. Discharge of sewage flows into the Chicago River and Lake Michigan and the use of Lake Michigan and shallow wells as sources of drinking water is described. The actions of city officials in instituting municipal sanitation measures are discussed. Included are sewers, water system, garbage collection, vaccination, burials in regulated cemeteries, stockyards regulations, and inspection of meat, milk, housing and smoke. The most detailed discussions of the article concerns sewers. (Poertner-Chicago)
W71-07696

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.

US Dept of Interior, Federal Water Pollution Control Admin, Conference on Pollution of Interstate Waters of Lake Champlain and Its Tribuary Basin - New York - Vermont, 1969. 378 p.

Descriptors: *Water pollution control, *Conferences, *Lakes, *Governments, Federal government, New York, Vermont, Lake basins, Lake beds, Water pollution, Water pollution sources, Water pollution effects, Pollution abatement, Industrial wastes, Statistics, New England, Water pollution treatment, Lake soils, Economics, Lake fisheries, Standards, Impaired water quality, Recreation, Dissolved oxygen, Fishing, Eutrophication.
Identifiers: *Federal Water Pollution Control Act, Water quality criteria.

The Conference was convened pursuant to paragraph 10 of the Federal Water Pollution Control Act to deal with the problem of pollution of Lake Champlain. Federal, New York, and Vermont agencies were represented. The geography and characteristics of the lake basin were discussed in detail. The major area of pollution is toward the southern end of the lake, especially around a large paper factory at Ticonderoga. Specific problems such as sludge deposits, decreased oxygen supply, effect on fishing and recreation, and thermal pollution were discussed. Detailed statistical evidence of the extent of the water pollution was presented, and reports were made on the water quality criteria of New York and Vermont. Findings and conclusions were reached on the nature and extent of the pollution problem and remedial measures to be taken. Emphasis was placed on standardizing efforts by New York and Vermont in dealing with with water pollution. (Caldwell-Florida)
W71-07697

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME I, THE LONG RUN EFFECTS OF WATER PRICING POLICIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Marshall Gysi.
Available from the National Technical Information Service as PB-198 440, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 25, Mar 1971. 322 p, 54 fig, 14 append, 32 ref. OWRR Project C-1640 (No 3151) (1).

Descriptors: *Water rates, *Dynamic programming, *Optimum development plans, Economic efficiency, Municipal water, Water policy, Pricing, Water supply.
Identifiers: *Capacity expansion.

As part of a sequence of studies utilizing optimization and simulation techniques to analyze a variety of metropolitan water resource problems, this study was concerned with the long term effects of presently used and alternatively proposed water pricing policies. A discrete deterministic dynamic programming model was structured and solved to determine the optimal water supply capacity expansion paths for a hypothetical and actual metropolitan community. Demand curves, population sizes and growth rates for various economic sectors of the community were specified, as well as short run production and capital construction costs. The objective of dynamic programming model was the maximization of future discounted consumers' surpluses plus producer's revenues net of the long run cost of supply. State variables were the MGD of system capacity and state variables were the years that the feasible capacity increases. The model was structured so that social preferences or weights could be attached to the benefit or loss functions of any economic sector, to check their effect on overall results. Several policies, including flat rates, constant rate, decreasing or increasing block rates and summer differential rates were tested. The sensitivity of varying discount rates, growth rates and patterns, capacity increment size and timing, and planning horizons was examined. It was concluded that price plays a major role in the long run planning and conservation of water supplies. (See also W71-07060) (Kriss-Cornell)
W71-07059

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME II, RESERVOIR REGULATION: SOME TECHNIQUES AND RESULTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
Moshe Gablinger.
Available from the National Technical Information Service as PB-198 441, $3.00 in paper copy, $0.95 in microfiche. Technical Report No 26, Mar 1971. 186 p, 40 fig, 13 tab, 5 append, 33 ref. OWRR Project C-1640 (No 3151) (2).

Descriptors: *Reservoir operation, *Dynamic programming, *Stochastic processes, *Optimization, Analytical techniques, Multiple-purpose reservoirs.
Identifiers: Targets, Operating policies.

As part of a sequence of studies utilizing optimization and simulation techniques to analyze a variety of metropolitan water resource problems, this study was concerned with the efficient operation of existing reservoir systems subjected to both serially and cross correlated random inflows. This study examined the multi-purpose use of single and two reservoir in series systems. For linear loss function it was shown that the optimal yearly operation rule for a single reservoir was independent of inflow into upstream and downstream reservoirs. However, the optimal operation of upstream reservoirs is a function of the inflow distribution into upstream and downstream reservoirs. Both analytical and computational results were discussed. The results presented, while limited, indicated both the advantage and difficulties to be expected in extending the methodology to larger river basin systems. (See also W71-07059) (Kriss-Cornell)
W71-07060

AN APPROACH TO RESERVOIR TEMPERATURE ANALYSIS,
Corps of Engineers, Sacramento, Calif.
L. R. Beard, and R. G. Willey.
Water Resources Research, Vol 6, No 5, p 1335-1345, Oct 1970. 11 p, 7 fig, 2 tab, 4 ref.

Descriptors: *Water temperature, Reservoir operation, Solar radiation, *Reservoirs, *Water quality, Stratification, Hydrology, Outflows, Energy transfer, Air temperature, Models, Reservoir evaporation, Inflow, Water resources development, Quality control, Thermocline, Computer programs, *Computer models, Hydrologic data, Reservoir stroage.
Identifiers: Temperature studies.

Several mathematical models for analyzing reservoir temperature stratification involving examination of hourly temperature changes have been developed. Use in practical applications is limited because of large amounts of observational data required. There is an increasing use of reservoir storage for bridging drought periods that requires examination of many combinations of reservoir storage levels and seasonal inflow patterns. Selecting a few representative years for analysis is not possible because 30 or more years of data are required. This approach is practical only if a long computation interval, such as one month, may be used. Observational data needed in existing models are ordinarily not available. A practical model must use generalized data such as average air temperature and average radiation. A generalized model must be capable of making releases through specific outlets or automatically selecting the outlets that will maintain outflow temperatures within a desired range as long as possible and leave the temperature of the remaining stored water at an optimum value. A computer program has been developed that conforms to these requirements and automatically calibrates the model. (USBR)
W71-07072

OPTIMAL POLICY FOR OPERATION OF A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C. Water Resources Research Inst.
For primary bibliographic entry see Field 04A.
W71-07133

OPTIMAL PLANS FOR CAPACITY EXPANSION OF WATER-SUPPLYING FACILITIES,
Illinois Univ., Urbana. Water Resources Center.
Hirohide Hinomoto.
Available from the National Technical Information Service as PB-198 521, $3.00 in paper copy, $0.95 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 39, Jan 1971. 59 p, 5 fig, 7 tab, 33 ref, append. OWRR Project S-014-ILL (1).

Descriptors: *Economic feasibility, *Optimum development plans, Facilities, Linear programming, Markov processes, *Water supply, Water treatment, Optimization, distribution systems, Model studies, *Planning, *Costs, Operating costs, Estimated costs, *Storage capacity.

A rapid increase in population accompanied by sustained improvement in living standards has necessitated the consideration of expanding the water treatment and or distribution systems in many areas. To aid in these considerations an economic decision model for selecting optimal expansion plans has been developed. The model formulated is composed of an objective function minimizing the total cost of investment and operation and set of constraints on the treatment and storage capabilities satisfying the annual requirements on the expected maximum daily demand. Equalization during the daily peak period and fire fighting scale effects in the capital and operating costs were represented in the model by exponential functions. Demand was assumed to continuously increase over a finite period beyond which it stays at a maximum level. The original nonlinear formulation was linearized and then applied to the Champaign-Urbana area for demonstration purposes. It was concluded that the usefulness of the model depends much on the availability of reliable information on future demands and the capital and operating costs of the proposed facilities. Furthermore there is a need to more clearly identify the relationship between designing under capacity and the penalty that this decision imposes on the water supplying agency.
W71-07134

STREAM QUALITY MODELING BY QUASILINEARIZATION,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. Stanley Lee, and Irving Hwang.
Journal Water Pollution Control Federation, Vol 43, No 2, p 306-317, Feb 1971. 12 p, 2 fig, 8 tab, 6 ref. OWRR Project B-015 KAN (5).

Descriptors: *Mathematical models, *Water quality, *Biochemical oxygen demand, *Dissolved oxygen, Water pollution, Path of pollutants, Water pollution effects, Linear programming, Model studies, Numerical analysis.
Identifiers: *Water quality models.

The quasilinearization technique, also known as the generalized Newton-Raphson method, can be used to identify or estimate the parameters in river or stream pollution. The parameters can be estimated directly from the differential equations representing the pollution model and from measured data such as biochemical oxygen demand and dissolved oxygen. Because of the rapid convergence property of this approach, it is a powerful technique for the dynamic modeling of water pollution problems. Several examples are solved to illustrate the technique. With very approximate initial guesses for the unknown parameters, only three to five interations are needed to obtain a four- to five-digit accuracy. (Knapp-USGS)
W71-07187

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES.
Illinois State Dept. of Business and Economic Development, Springfield.

Available from the National Technical Information Service as PB-196 814, $3.00 in paper copy, $0.95 in microfiche. May 1970. 53 p, 22 fig, 13 tab. HUD Project No Ill P-260.

Descriptors: *Planning, *Water resources development, *Long-term planning, *Illinois, *Financing, *Administration, *Investment priorities, Analytical techniques, Evaluation, Coordination, Administrative agencies, Water demand, Water quality control, Recreation, Flood damage.
Identifiers: *Guidelines, Implementation techniques.

This is a resume of an in-depth study of the overall planning and administrative considerations relating to water resource developments in Illinois involving possible state financial participation. The report summarizes basic state needs, guidelines and priorities. The priorities guide Illinois investment in major water resource activities involving State programs or developmental responsibilities. State guidelines for administrative evaluation and for expediting specific proposals are clearly defined. These administrative tools are designed to speed accurate evaluation and processing of both state and federal development activities. Coordinated guidelines and a system of priorities are presented to facilitate the administration of federal or state financial assistance to local communities for each of the water resource related programs. Major emphasis is placed on the self-help financial need values. Adoption of the planning, evaluation, and selection procedures by the Illinois Natural Resource Development Board in May 1970 initiates the active use of the proposed implementation techniques by the participating agencies. The comprehensive compilation of technical resource data in the separate technical appendix further serves as a reference bank and inventory base for future water resource activity. (See also W71-07198) (Poertner)
W71-07197

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES, TECHNICAL APPENDIX.
Illinois State Dept. of Business and Economic Development, Springfield.

Available from the National Technical Information Service as PB-196 815, $3.00 in paper copy, $0.95 in microfiche. May 1970. 137 p, 32 fig, 43 tab, 48 ref. HUD Project No Ill P-260.

Descriptors: *Planning, *Water resources, *Illinois, *Statistics, *Water supply, *Water demand, *Census, Water utilization, Flood damage, Water quality control, Recreation, Administration, Economics, Investment, Evaluation.
Identifiers: *Water resources statistics, *Water facilities, Data summaries, Water data tabulations.

This Appendix presents the water supply condition for the 1,300 incorporated Illinois communities. Eight regions corresponding roughly, on a county basis, to the river basins are mapped and the summarized data are listed in a table. Tables are also included listing communities where well-capacity or the surface water source could soon become deficient, where filtration plants or pumping capacity can no longer meet increasing demands, and where there are no public water supplies. The report raises many questions which will require further investigation. For instance, actual gallons per capita consumption has been on the increase. How much of this is due possibly to increased leakage as the water system ages can be determined only where all the water is metered. Increased use of wash water in filter systems is tied closely to population increases as is the increased municipal government use of water, most of which is unmetered. Discussions of the data presented in the tables and predictions of future water conditions and requirements are included. (See also W71-07197) (Poertner)
W71-07198

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
Richard N. Symonds, Jr., and Sidney C. Albertsen.
Available from the National Technical Information Service, as PB-196 623, $3.00 in paper copy, $0.95 in microfiche. Apr 21, 1970. 24 p. HUD Project No P-102.

Descriptors: *Bibliographies, *Publications, *Information retrieval, *Planning, *Water resources development, *Connecticut, Long-term planning, Short-term planning, Sewerage, Water supply, Drainage programs, Flood control, Recreation.
Identifiers: *Planning documents, Regional planning.

This bibliography includes reports and documents relating to water resources planning in Connecticut and is presented in two parts. Part I is a listing of the publications by 'authorizing-agency' categories and 'subject' classifications. Part II is a listing by 'subject' categories and 'authoring-agency' classifications. The bibliography was prepared to fulfill one of the objectives of the Connecticut Water Resources Planning Project which was authorized by Public Act 477 of the 1967 Connecticut General Assembly. The bibliography includes an inventory of selected regional planning agency reports, river basin study reports, and a variety of miscellaneous federal, interstate, and State agency documents. It was prepared to serve as a working document for the staff of the Water Resources Planning Project, but it is being made available to other agencies for information purposes. Reports and publications contained herein are on file with the Connecticut Water Resources Planning Project staff in the Office of State Planning, and can be examined in the office. The listing contained in the bibliography does not necessarily indicate general availability of documents. Some documents are out of print and are not available for distribution while others are available upon request. A total of 103 publications are listed. (Poertner)
W71-07200

A STATUS REPORT AND DESCRIPTION OF COMPREHENSIVE LONG RANGE WATER RESOURCES PLANNING IN CONNECTICUT.
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.

Available from the National Technical Information Service, as PB-196 621, $3.00 in paper copy, $0.95 in microfiche. Apr 21, 1970. 5 p, 1 fig, 1 tab. HUD Project No P-102.

Descriptors: *Planning, *Long-term planning, *Short-term planning, *Water resources development, *Connecticut, Sewerage, Water supply, Project planning.
Identifiers: *Regional planning agencies.

Progress made in developing a statewide long range plan for the management of water resources in Connecticut and in preparing regional sewer and water facilities plans is summarized. Public Act 477 of the 1967 General Assembly, together with amendments to the Act passed in 1969, authorized this work and provided $1,500,00 of bond issue funds. The Act designates that the plans be prepared jointly by the Water Resources Commission, the State Health Department, the State Board of Fisheries and Game and the Connecticut Development Commission. An Interagency Water Resources Planning Board was created to carry out the requirements of the Act. The Office of State Planning is the contracting and administrative agency for the Board. The following has been accomplished: inventoried recreational, water supply, sewerage and flood control facilities along with uses and needs relating to Connecticut water resources; prepared work maps, charts and graphs; inventoried files and listings of planning materials and documents on Connecticut water resources; evaluated the water supply and sewer requirements of the four alternative planning concepts for future land use prepared by the Connecticut Interregional Planning Program; and evaluated Regional Planning Agency recommendations to determine interregional and statewide implications. Major work remaining includes: immediate and long range water resources plans; specific recommendations and proposals; and a statewide long range plan for the management of the States' water resources. (Poertner)
W71-07201

DOWNTOWN: AN ECONOMIC-ENVIRONMENTAL SIMULATION GAME,
Pennsylvania State Univ., University Park.
Wesley H. Long.
Reprint Series No 17 from: Proceedings of the Second Annual Environmental Design Research Association Conference, Pittsburgh, Pennsylvania, Oct 1970. 8 p, 5 tab, 1 fig.

Descriptors: *Urbanization, Environment, Economics, City planning.
Identifiers: *Economic-Environmental simulation game, Town council, Metropolitan Areas, Urban environment.

This game is designed to bring out interactions among economic and environmental decisions. Teams have economic interests focused by their roles in the game and environmental interests focused by their habitation locations in a town. They vie individually through exchange and collectively through an elected Town Council to achieve economic gain and an improved environment. Conflicts encountered between teams and Town Council when they attempt to realize both the goals simultaneously replicate in miniature and in a collapsed time frame the strains and tensions experienced by a real community. (Wray-Chicago)
W71-07317

ON THE EXTENSION OF INPUT-OUTPUT ANALYSIS TO ACCOUNT FOR ENVIRONMENTAL EXTERNALITIES,
Dartmouth Coll., Hanover, N.H.
A. O. Converse.
American Economic Review, Vol LXI, No 1, p 197-198, Mar 1971.

Descriptors: *Input-output analysis, *Economic analysis, *Environment, *Pollution, Wastes, Taxes, Government, Capital, Investment, Conservation, Waste treatment, Social aspects.
Identifiers: *Ayres-Kneese model, Consumption activities, Residuals, Pollution tax.

The Ayres-Kneese model of input-output analysis is extended. The model had been originally extended to include the flow of wastes to the environment and the recycle flow of wastes to the production sectors by adding two sectors of consumption and environment. The author further extends this model after showing that, as presented above, it did not correctly account for the individual waste residues from the various production sectors. Changes are proposed to alter this situation, including a change which permits accounting for the various types of waste residue from both production and consumption activities. This last change being necessitated by specific residue activities. It is pointed out that such treatment while changing the composition of the waste residues increases the total amount of them, rendering pollution analysis of total residue useless for pollution control purposes. For this reason, this article is especially useful for efficient pollution analysis, and therefore optimal pollution control measures of environmental factors. (Murphy-Rutgers)
W71-07560

A BARGAINING MODEL OF THE PURE THEORY OF PUBLIC EXPENDITURE,
York Univ. (England).
Shibata Hirofumi.
Journal of Political Economy, Vol 79, No 1, p 1-29, Jan-Feb 1971.

Descriptors: *Government, Optimization, Income, Social aspects, Budgets, Model studies, Taxes, Cost, Marginal costs, Government supports, Welfare economics.
Identifiers: *Public goods, *Public expenditure, Bilateral monopoly, Behavioral assumptions, Pareto-optimality, Isoguants, Externalities.

This article presents a geometric analysis of public goods similar to that of bilateral monopoly after indicating the essential identity of the two theories in the typical bargaining between a few self-interested parties contracting in the absence of external pressure. The article first demonstrates that the pure theory of public expenditure formalized in terms of a collective-consumption (or public) good can be shown diagramatically similar to a case of bilateral monopoly. The author then relates the diagrammatic exposition of the determination of public expenditure to earlier studies in the area to show that their different implicit behavioral assumptions are to blame for the disagreements. Finally the paper limits the range of possible equilibrium solutions in terms of public and private product mix and the tax bill distribution for certain cases, including the relative marginal costs of public expenditure. This step is necessary to avoid the result of multiple solutions unless other nonconomic variables are introduced. This article is relevant to water studies because of its theoretical insights into public goods and expenditures issues. (Murphy-Rutgers)
W71-07580

PARETO, PUBLIC GOODS AND POLITICS,
McMaster Univ., Hamilton (Ontario).
David M. Winch.
Canadian Journal of Economics, Vol 2, No 4, p 492-508, Nov 1969.

Descriptors: *Resource allocation, Welfare economics, Taxes, Decision-making.

Identifiers: *Pareto optimum, Equity, Income distribution, Public good, Benefit taxation.

This article examines the consequences of a Paretian value judgment on a model encompassing both private and public goods. Distribution must be decided first and be imposed by government, while allocation between private and public goods depends on the nature of the utility function. The author explores the possibility of determining the optimum value of public goods through the democratic political process or majority rule. Majority rule reaches an equilibrium allocation but the subsequent allocation is not optimal. Political system involving pressure groups, propaganda, vote trading and bribery can lead to a Pareto optimum result. These conclusions are interpreted as pointing out the dangers of confusing equitable income distribution and optimal resource allocation. This paper is relevant to water research concerned with the theoretical aspects of the role of equity criteria in decision making. (Siegenthaler-Rutgers)
W71-07581

JOINT GOODS,
Johns Hopkins Univ., Baltimore, Md.
William H. Oakland.
Economica, Vol XXXVI, No 143, p 253-268, Aug 1969.

Descriptors: *Resource allocation, *Welfare economics, Taxes.
Identifiers: *Externality, Subsidy, Joint good, Pareto optimality, Public good, Social cost, Social benefit.

This paper considers a generalization and extension of Samuelson's public goods analysis to goods for which jointness in consumption is not complete. Joint goods share some of the features of both private and public goods and the analysis of joint goods is most suitable for the problem of externalities in consumption. The conditions for Pareto optimality for joint goods differ from the public goods case and involve restrictions upon the pattern of direct consumption by individuals. Since the market economy does not generate a Pareto optimal solution for joint goods, the author suggests the government use a pricing scheme based on taxes and subsidies to satisfied Pareto conditions. This pricing policy is based upon information concerning the marginal rate of substitution between direct and indirect consumption. Finally, the provisions of joint goods within a federal system is analyzed along with optimal policy for grants-in-aid to the states. This paper is relevant to water research concerned with the theory of public expenditure and taxation. (Siegenthaler-Rutgers)
W71-07582

A NOTE ON THE DYNAMIC PLANNING OF INVESTMENT PROJECTS,
Technion - Israel Inst. of Tech., Haifa; and Montreal Univ. (Quebec).
Mordechai Shechter, and Peter L. Hammer.
European Economic Review, Vol 2, No 1, p 111-121, Fall 1970.

Descriptors: *Decision making, Non-linear programming, Budget constraint, Economic evaluation, Cost, Discount rate.
Identifiers: *Dynamic planning, Capital budgeting, Objective function, Present value, Boolean technique.

This paper considers the problems of optimally selecting investment projects with a finite planning horizon using a non-linear programming model. This formulation allows the author to consider complex problems without restricting the analysis to models involving only linear constraints and objective functions. The author first considers a one period capital budgeting model which is formulated by maximizing the net present value of the benefits subject to budget constraints. The more general case of time dependent capital budgeting is then discussed with constraint equations composed of technological and budget dependencies. An outline of the solution method to this model is given using Boolean techniques. The author uses as an example the case of three independent projects and then illustrates how the non-linear programming method generates an optimal solution. This article is relevant to water research concerned with capital budgeting analysis. (Siegenthaler-Rutgers)
W71-07587

DYNAMIC PROGRAMMING FOR CONJUNCTIVE WATER USE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-07616

OPERATIONAL HYDROLOGY FOR UNGAGED STREAMS BY THE GRID SQUARE TECHNIQUE,
Department of Energy, Mines, and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02E.
W71-07622

QUASILINEARIZATION AND THE IDENTIFICATION OF AQUIFER PARAMETERS,
California Univ., Los Angeles. Dept. of Engineering Systems.
William W-G. Yeh, and George W. Tauxe.
Calif Univ Water Resources Center Project W290. Water Resources Research, Vol 7, No 2, p 375-381, Apr 1971. 7 p, 2 fig, 3 tab, 10 ref.

Descriptors: *Parametric hydrology, *Linear programming, *Mathematical models, *Aquifer characteristics, Simulation analysis, Computer programs, Storage coefficient, Transmissivity, Confined water, Systems analysis, Data processing.
Identifiers: Quasilinearization.

A new computational procedure based on observations at observation wells is presented to solve the problem of identifying aquifer parameters. This new procedure (quasilinearization), is an effective way to convert the observations directly to aquifer parameters. The procedure is advantageous because it involves neither curve plotting nor graphical matching. It makes full use of the ability of the modern high speed digital computer to integrate a system of ordinary differential equations with given initial conditions. The parameters to be identified are the storage coefficient and transmissivity in a confined aquifer system. (Knapp-USGS)
W71-07628

A COURSE OF LECTURES ON PARAMETRIC OR ANALYTICAL HYDROLOGY,
University Coll., Galway (Ireland).
J. E. Nash.
Great Lakes Institute, University of Toronto, P R 38, 1968-1969. 177 p, 64 fig, 3 tab, 5 append, 30 ref.

Descriptors: *Hydrology, *Analytical techniques, *Parametric hydrology, *Systems analysis, *Optimization, *Unit hydrographs, *Frequency analysis, Runoff.
Identifiers: *Linear hydrologic system, Conceptual models.

This paper presented the 15 lectures given by the author on Parametric or Analytical Hydrology at the Universities of Ontario. Included in the subjects of these lectures were: applied hydrology; systems and the operation method; lumped time-invariant linear system, in respect to convolution, and continuity, stability, damping; hydrologic systems; discrete expression of convolution; and unit hydrograph computation. A general linear hydrologic system was described in detail. The relationship between the unit hydrograph and the catchment was investigated and many different approaches were cited. An explanation of the use of conceptual models of the runoff process was given and such operations as optimization and sampling variance were noted. The last of the lectures dealt with hydrologic frequency prediction, specifically prediction from samples, indirect prediction and use of inference methods. The appendices provide some additional operational techniques. (Kriss-Cornell)
W71-07693

SOCIO-ECONOMIC SIMULATION FOR WATER RESOURCE SYSTEM PLANNING,
Department of Energy, Mines and Resources, Ottawa (Ontario). Policy and Planning Research Branch.
Peter J. Reynolds, and Asit K. Biswas.
Report, Resources Research Centre, Policy and Planning Branch, Dep of Energy, Mines and Resources, Ottawa, Canada, 1969. 8 p, 23 ref.

Descriptors: *Simulation analysis, *Water resources, *Planning, *Forecasting, *Decision making, Economics, Resource allocation, Government supports, Evaluation.
Identifiers: Regional models, Economic behavior, Socio-economic models.

The current status of socio-economic simulation in water resource planning was examined. Two broad subsystems in water resource planning were distinguished: the physical-technologic subsystem and the socio-economic subsystem. By selecting the significant variables in a given economy, and analyzing the interaction between them, it was possible to develop economic models which would be of great value in interpreting, if not predicting, economic behavior of the real world. Regional economic models provided a better structural understanding of the complex processes of economic and behavioral interactions within a system, as well as making possible regional forecasts. These in turn, provided guidelines for better policy planning and decision making. Three problem-oriented models were discussed: the Lehigh, Ohio, and Susquehanna basins. Efficient allocation of limited national resources among competing government programs was achieved by the measurement of their relative cost effectiveness. This could be done by the evaluation of social, political and economic effects on human beings, using national and regional socio-economic models. (Thiuri-Cornell)
W71-07695

6B. Evaluation Process

THE ECONOMIC FEASIBILITY OF ESTABLISHING AN IRRIGATED FORESTRY ENTERPRISE ON THE HANFORD RESERVATION, WASHINGTON,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05D.
W71-07152

THE EGYPTIAN AGRARIAN REFORM: PROBLEMS AND PROSPECTS,
For primary bibliographic entry see Field 03F.
W71-07163

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
T. E. Murphy.
Sponsored by US Army Engineer District, Buffalo. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-3, Apr 1970. 14 p, 8 tab, 8 photo, 10 pl.

Descriptors: *Inland waterways, *Hydraulic models, Navigation conditions, Locks.
Identifiers: *Lake Erie-Lake Ontario Waterway.

Investigation was conducted to assist in determination of the economic justification of a water route connecting Lake Erie and Lake Ontario. Specifically, the studies involved determination of the most functional and economical location for a lock in the vicinity of Buffalo, N.Y., and evaluation of navigation conditions at the entrance to an overland canal joining the American channel of the Niagara River northwest of North Tonawanda, N.Y. An existing model of the Niagara River with a horizontal scale of 1:360 and a vertical scale of 1:60 and a new undistorted model of the canal entrance with a 1:120 scale were used in the investigation. Tests demonstrated the desirability of placing the new lock in the vicinity of Buffalo as far downstream as is feasible without rendering the existing Black Rock Lock and Canal inoperable during the construction period. Navigation problems at the canal entrance were not as severe as had been contemplated and a small amount of overexcavation resulted in satisfactory conditions. (Murphy-WES)
W71-07172

THE UNIVERSITY'S ROLE IN NATIONAL WATER POLICY.

Flack, J. Ernest, Editor. Proceedings of Universities Council on Water Resources Conference, July 27-28, 1970, Blacksburg, Virginia, 1970. 128 p, 3 append.

Descriptors: *Conferences, *Water resources development, *Universities, Water resources research act, Training, Research and development, Planning, Economics, Social aspects, Social impact, Education, Management, Water management (Applied), Water demand.
Identifiers: *Universities Council on Water Resources.

The Universities Council on Water Resources is an organization of universities that are active in both graduate education and research in water resources. The aim of the Council is to encourage education and research in these areas and to provide a clearing house for information as well as a forum for discussion of questions of mutual interest. This conference proceedings is the record of one of a series of meetings that have been held annually since 1965. The topics discussed include national water policy, planning, education, research, sociology, land-water relations, hydrology, water quality, and water resources engineering. (Knapp-USGS)
W71-07183

A STUDY OF LOCAL NEEDS FOR WATER POLLUTION CONTROL FACILITIES IN FISCAL YEARS 1971-76.
National League of Cities, Washington, D.C.; and United States Conference of Mayors, Washington, D.C.
For primary bibliographic entry see Field 05D.
W71-07192

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES.
Illinois State Dept. of Business and Economic Development, Springfield.
For primary bibliographic entry see Field 06A.
W71-07197

PRIORITY AND PLANNING ELEMENTS FOR DEVELOPING ILLINOIS WATER RESOURCES, TECHNICAL APPENDIX.
Illinois State Dept. of Business and Economic Development, Springfield.
For primary bibliographic entry see Field 06A.
W71-07198

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07200

A STATUS REPORT AND DESCRIPTION OF COMPREHENSIVE LONG RANGE WATER RESOURCES PLANNING IN CONNECTICUT.
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07201

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.

Partially supported by Water Resources Center, Univ of Calif and by Dept of Housing and Urban Development. West Side San Joaquin Valley Coordinating Council, California University Water Resources Center Report No 20, Sept 1970. 22 p, 1 fig, 2 map, 2 photo, 1 tab. Project W-187.

Descriptors: *Environmental engineering, *California, *Water resources development, Land development, Economics, Valleys, Agriculture, Recreation, Population, Education, Projects, Planning, Reviews.
Identifiers: *San Joaquin Valley (Calif).

Long-term plans among California's institutions of higher education, the state and local governments, and public, private, and voluntary organizations for developing the San Joaquin Valley are summarized. Issues such as the following are among those to be examined in the proposed study: Potential impacts of new water and transportation links that are being built now through the West Side of the Valley and their possible effects on the Valley's ecology, public service systems, industries, and social environment. Location, magnitude, characteristics, and effects of possible new population growth in the Valley; and Public and private policy alternatives that might assure Valley residents that their future will not be overcrowded, polluted, or conflict ridden in the manner that already has blighted some other developing areas of the United States. (Woodard-USGS)
W71-07241

CRISIS IN WATER SUPPLY,
David Clutterbuck.
New Scientist and Science Journal, Vol 49, No 743, p 624-627, Mar 18, 1971. 4 p, 2 fig, 2 photo.

Descriptors: *Water supply, *Water shortage, *Water resources development, Surface waters, Groundwater, Water storage, Reservoirs, Water demand, Water consumption, Aquifers, Injection wells, Recharge wells.
Identifiers: *England.

Large areas of Britain are on the verge of acute water shortage, resulting from the disruption of supply programs, and there are no short term remedies. Britain is not a wet country. In Europe, only Malta has a lower mean annual rainfall. Reservoirs are responsible for only a minute fraction of the agricultural land appropriated for other uses each year, but they are vulnerable to public criticism because the land they use is concentrated into a few large plots. Until recently most undertakings were able to draw on their surpluses, but these have been gradually eroded by increasing demand, and shortages in some areas are beginning to assume crisis proportions. Too great a lowering of the water table increases the risk of infiltration by seawater--which, in this case, has already begun. The Water Resources Board, which at present has only an advisory status, wants the power to organize national water supplies on a mandatory basis. (Woodard-USGS)
W71-07282

WATER FOR THE FUTURE OF LONG ISLAND, NEW YORK,
Geological Survey, Albany, N. Y.
Philip Cohen, O. L. Franke, and B. L. Foxworthy.
New York Water Resources Bulletin 62A, 1970. 36 p, 14 plate.

Descriptors: *Water management (Applied), *Water resources development, *New York, Water resources, Groundwater, Surface waters, Aquifers, Saline water intrusion, Artificial recharge, Safe yield, Water wells.
Identifiers: *Long Island (NY).

This booklet summarizes the water resources of Long Island, N. Y., and emphasizes some of the different approaches that might be taken in managing the water resources of Long Island. Water-management objectives, ranging from very general to very specific, should be clearly and precisely defined. All the alternative methods of achieving these objectives should be recognized. Many alternative methods of development are, to some extent, self-defeating. For example, the construction of sewers to prevent pollution from cesspools and disposal basins could substantially decrease artificial recharge and, therefore, might accelerate pollution by encroaching salt water. Likewise, artificial recharge using reclaimed sewage water may help alleviate the problem of salt-water intrusion, but it also ultimately could cause an undesirable increase in the dissolved-solids content of the groundwater. Other alternatives, ranging from desalination of sea water (or of salty groundwater from the zone of diffusion) using atomic energy, to a recent proposal for converting Long Island Sound into a huge freshwater reservoir, must be carefully considered. (Knapp-USGS)
W71-07293

WATER FOR CALIFORNIA--OUTLOOK IN 1970.
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 06D.
W71-07296

ATTITUDES FOR ENVIRONMENTAL PLANNING IN THE 1970's,
Utah State Univ., Logan.
Dean F. Peterson.
Water Research Laboratory, Occasional Paper 4, Utah State University, Logan, Utah, June 1970. 9 p.

Descriptors: *Attitudes, *Environment, *Planning, *Social aspects, Population, Decision making.
Identifiers: *Environmental design, Ecological system.

The engineer stands between science and society and it is his special job to apply science to the use of resources for the benefit of man. Society has benefitted by the engineer's contribution to public water supply systems, agriculture, transportation, electricity, urban planning, and environmental matters. Four suggestions to be considered by engineers who work with environmental design are offered: (1) We need to understand and appreciate ourselves as part of nature, not as separate from it; (2) We need to recognize that absolute solutions to environmental problems do not exist, that solutions are choices among options; (3) We need to recognize the difficulty of the decision-making process when the common earth environment is involved; (4) We need to reassess our own personal values and priorities. (Wray-Chicago)
W71-07309

THE SAN FRANCISCO BAY PLAN: COMBINING POLICY WITH POLICE POWER,
For primary bibliographic entry see Field 06E.
W71-07316

AN OPTIMAL SITING MODEL FOR THERMAL PLANTS WITH TEMPERATURE CONSTRAINTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 05G.
W71-07423

IMPLEMENTATION OF REGIONAL RESEARCH IN WATER-RELATED PROBLEMS.
Economic Research Service, Madison, Wis.

Massey, Dean T, ed. Report of a Seminar held at Farm Foundation, published by Department of Law, University of Wisconsin, Madison, Jan 1970. 75 p.

Descriptors: *Planning, Institutions, *Legal aspects, Management, *Regions, *Interstate.
Identifiers: North Central Land Economics Research Committee, National Water Commission, Corps of Engineers.

This publication is the printed proceedings of a one day seminar, held at the Farm Foundation in Chicago on January 14, 1970, which explored approaches to implementing economic and legal research on regional water-related problems. The publication includes four speeches and responses to these speeches. (See also W71-07498 thru W71-07500) (Holmes-Rutgers)
W71-07497

PROMISING AREAS FOR RESEARCH ON INSTITUTIONAL DESIGN FOR WATER RESOURCES MANAGEMENT,
Wisconsin Univ., Madison. Dept. of Urban and Regional Planning.
Irving K. Fox.
In: Implementation of Regional Research in Water-Related Problems, Report of a seminar, University of Wisconsin, p 29-40, 1970. 14 ref.

Descriptors: *Decision-making, Cost sharing, Political aspects, Government finance, Social needs, Social participation, *Regions, *Interstate, *Institutions, Institutional constraints.
Identifiers: *Commerce Clause (US Consitution), Arizona, High Plains of Texas.

Basic problems of U.S. institutions that are concerned with water resources management are discussed. Specifically, in describing four areas, namely water quality management, the use of shorelands and flood plains, development of navigation facilities and the provision of irrigation water in the West, the author finds a lack of communication between the people paying the bills for these projects and the ones benefiting from these projects. He identifies the number one item for public study as the 'search for a precise formulation of the conditions institutions must meet to serve society effectively.' He, furthemore, emphasizes the need for more communication between the planners and the public, so that everyone can have the opportunity to understand the available alternatives and express their intelligent opinion about future publicly financed water resource and water quality projects. (See also W71-07497) (Holmes-Rutgers)
W71-07498

PRIORITIES FOR DEVELOPING LEGAL AND ECONOMIC RESEARCH ON WATER PROBLEMS,
Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div.
Jan Van Schilfgaarde.
In: Implementation of Regional Research in Water-Related Problems, Report of a seminar, University of Wisconsin, p 1-12, 1970. 23 ref.

Descriptors: *Planning, *Institutions, Evaluation, *Social aspects, *Economics, *Regions.

Areas for future research in water problems are identified and the need for more interdisciplinary approaches to this research are stressed. Also discussed are some of the institutional problems that researchers face with special emphasis on the research situation at the Agricultural Research Service of the U.S. Department of Agriculture. The author points to several examples of well integrated research between social scientists and physical scientists but criticizes many for working in isolation and not relating their specific research problem to the larger problem. (See also W71-07497) (Holmes-Rutgers)
W71-07499

A NEW LOOK AT NATIONAL WATER POLICY,
National Water Commission, Arlington, Va.
Theodore M. Schad.
In: Implementation of Regional Research in Water-Related Problems, Report of a seminar, University of Wisconsin, p 61-70, 1970. 5 ref.

Descriptors: *Federal government, *Planning, Water resource development, Regions, Interstate, *Water policy.
Identifiers: *National Water Commission, Colorado River Basin.

The National Water Commission's tasks and progress during its first year of activation are described. Established in September 1968, the National Water Commission is charged with the task of 'preparing a report on the nation's water needs and making recommendations simultaneously to the President and the United States Congress as to how these needs can best be met.' By holding conferences throughout the country, the Commission has attempted to identify the problems that are most important to the public. In addition, the Commission has attempted to tap the minds of as many of the leading water authorities as possible and has initiated new studies on several important aspects of water resources problems. The Commission will submit its report in 1973. (Holmes-Rutgers)
W71-07500

RIVER BASIN AUTHORITIES: A NATIONAL SOLUTION TO WATER POLLUTION,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 05G.
W71-07559

REGIONAL DEVELOPMENT, EXTERNALITIES AND TAX-SUBSIDY COMBINATIONS,
Virginia Univ., Charlottesville.
Roger Sherman, and Thomas D. Willett.
National Tax Journal, Vol XXII, No 2, p 291-293, June 1969.

Descriptors: *Water pollution, *Tax, Water quality, Resource allocation, Economic efficiency, Decision making.
Identifiers: *Externalities, *Subsidy, Opportunity cost, Equity, Social cost, Regional development.

The implications for economic efficiency are considered when tax-subsidy combinations for industrial development and pollution control are combined. Recent research has stressed the symmetry between tax and subsidy means of controlling external diseconomies in water quality management when income distribution and administrative asymmetries are ignored. In the long run the imposition of a tax on polluters or a subsidy to firms complying with anti-pollution measures result in differences in the size of external effects and economic efficiency. This is due to the difference in the placement of the cost burden either on firms or the community as a whole. When the burden is placed on firms, firms may shift location and hence this results in loss of employment to the community. To alleviate this problem, the authors suggest the cost of pollution be shared equally by the firm and community with a combination tax and subsidy scheme. Furthermore, greater coordination among communities on industrial development would result in more acceptable pollution levels on a regional basis. (Siegenthaler-Rutgers)
W71-07562

A THREE STEP APPROACH TO POLLUTION REVERSAL,
Oregon Univ., Eugene.
Roman R. Andrus.
University of Washington Business Review, Vol 29, No 4, p 37-43, Summer 1970.

Descriptors: *Pollution abatement, Effluent charge, Economic efficiency, Cost-benefit analysis, Waste water disposal.
Identifiers: *Externalities, Social disutility tax, Subsidy.

An approach to pollution control is proposed utilizing a three step process aimed at controlling the three basic forms of pollutants. The author defines the basic forms of pollutants as the production and distribution of by-products by industry, the by-products of the consumption process and space allocation failures. First, standards are set for environmental quality to deal with problems of solid and waste water disposal. Secondly, pollution control requires that firms or individuals bear the liability for being the source of pollutants. Third, the author suggests that initially incentives must be provided by the government in terms of subsidies or tax relief to encourage firms to comply with pollution control objectives. As a second step, effluent charges should be levied in increasing amounts on firms who continue to engage in polluting activities. (Siegenthaler-Rutgers)
W71-07563

PROCEEDINGS, GREAT LAKES WATER RESOURCES CONFERENCE.

Toronto, Canada, the Hydro-Electric Power Commission of Ontario, June 24-26, 1968. 489 p.

Descriptors: *Great Lakes, *Water use, *Water resources planning, *Water quality, *Flow regulation, Multiple use, Navigation, Recreation, Pollution, R and D, Costs, Technology, Government, Lakes, Rivers, Optimization.
Identifiers: *Economic development, Shore property, Cost sharing, Canada.

This book is a compilation of several papers given at the Great Lakes Water Resources Conference, which was gathered to present and disseminate information bearing on the management and administration of various aspects of the Great Lakes resource. Topics presented include multiple uses of the Lakes, regulation of the lakes, and water quality in the lakes. The historical development of these topics is surveyed, as are present problems in the various areas. The water resource is viewed from both Canadian and United States viewpoints, particularly in its impact on the regional economies of the areas in the Great Lakes drainage basin. The future potential development of the Great Lakes as a resource is projected; and various development plans are proposed. A large segment of the book is concerned with the problem of pollution and methods to remedy and/or prevent such destruction in future development plans, as suggested by professionals in all appropriate areas. (See also W70-07566 thru W71-07576) (Murphy-Rutgers)
W71-07565

HYDRO-ELECTRIC POWER DEVELOPMENT ON THE GREAT LAKES SYSTEM,
Hydro-Electric Power Commission of Ontario, Toronto.
H. A. Smith.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Commission of Ontario, p 49-88, 1968.

Descriptors: *Hydro-electric power, *Great Lakes Region, *Flow regulation, *Lakes, *Water

resource development, Navigation, Water quality, Thermal pollution, Water supply, Recreation.
Identifiers: *International treaty, Economic development, Electric energy, Pumped storage plants.

A defense is presented of the need for additional hydro-electric power development on the Great Lakes system, proposing that such development is warranted by the expected benefits to the community and the constantly changing magnitude of the needs of the community for water resource exploitation. The past hydro-electric power development of the Great Lakes region as representative of the field. A brief description is given of the benefits of such development, treating such economic aspects as power development for community use, lake regulation, and navigation channels, in addition to the creation of parks and recreation areas and the enhancement of science spectacles. Additional electric energy could be produced by means of additional international lake regulation measures and/or by the construction of additional plant. Such economic developments could be achieved, the author suggests, by exploiting some of the characteristics of the Great Lakes system. (See also W71-07565) (Murphy-Rutgers)
W71-07566

HISTORY OF THE DEVELOPMENT OF USE OF THE GREAT LAKES AND PRESENT PROBLEMS,
Army Engineer Div., Chicago, Ill.
C. F. Macnist, and H. F. Lawhead.
In: Great Lakes Water Resources Conference, Toronto, the Hydro Electric Power Commission of Toronto, p 1-48, 1968.

Descriptors: *Great Lakes Region, *Water resource development, Population, Water supply, Economic analysis, Rivers, Lakes, Hydrology, Watershed, Transportation, Conservation, Recreation, Geography.
Identifiers: *Multiple-use resource, *Interdisciplinary approach, Power development.

Various aspects of the Great Lakes basin are considered, such as the resources of abundant water supply, the natural regulating influences of the lakes' surfaces, the minerals of the basin and nearby areas, and the surrounding arable and timbered regions. A brief history of the area's rapid development introduces the article, citing the growing population which will eventually call for further development and utilization of the Great Lakes resource by both the United States and Canada. The geography, geology, climatology, and hydrology of the Lakes and their drainage basin are described, as well as the economic ramifications of the area's development in commercial fishing, population growth, water transportation, mining, manufacturing, agriculture, power development, water supply, conservation and recreation. The end result of this discussion is conclusive indication that an interdisciplinary approach of both engineering and research must be coupled with a high degree of international coordination and cooperation to insure the optimal development of the many aspects of the Great Lakes water resources. (See also W71-07565) (Murphy-Rutgers)
W71-07567

COMMERCIAL NAVIGATION ON THE GREAT LAKES,
St. Lawrence Seaway Authority.
W. R. Mackay.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Commission of Ontario, p 89-114, 1968.

Descriptors: *Navigation, *Great Lakes, St. Lawrence River, *Economic analysis, *Canals, Technology, Transportation, Water supply, Drainage, Shipping.
Identifiers: *Commercial navigation, *Economic growth, *Economic development, Export trade, Railroads, Potash, Grain, Coal, Iron ore, Industrial development.

A history is presented of the growth of commercial navigation in the Great Lakes and St. Lawrence system from its beginning to the present. It indicates the relationship between the canal developments and the economic development and growth of the system as a whole. The historical economies of commercial navigation are juxtaposed with the historically non-competitive railroad technology which presented a far costlier alternative. Future growth possibilities for the Great Lakes system are proposed to exist in the potential development of Saskatchewan potash deposits, especially if combined with the increasing grain, coal, and iron ore traffic and the expansion of overseas trade. The author emphasizes that the value of commercial shipping to both the Canadian and American economies amounts to astronomical figures which influence both immediate and long-range export trade and the economic growth and development of both nations. (See also W71-07565) (Murphy-Rutgers)
W71-07568

CONFLICTS OF RECREATION AND OTHER USES OF THE GREAT LAKES,
Department of the Interior, Washington, D.C.
S. A. Cain.
In: Great Lakes Water Resources Conference, Toronto, Hydro-Electric Power Commission of Ontario, p 121-144, 1968.

Descriptors: *Great Lakes Region, *Fishing, *Costs, Water pollution, Planning, Watershed, Ecosystem, Streams, Lakes, Water quality, Recreation, Social aspects.
Identifiers: *Commercial fishing, *Alewife, *Cost accounting, *Total planning, Market conditions, Lamprey, Land use control.

The burden that pollution of the Great Lakes has imposed on the natural processes of renewal is considered. Particular attention is given to the conflicts of water uses in light of the alewife explosion. The conflict in this case was largely between the large profits of the alewife to the commercial fishing industry, and the dead alewife pollution of the beaches. The need for environmental awareness and the use of cost accounting which considers the ecosystem rather than only the per unit profit is called for to eliminate the high costs of water development for uses which ignore natural processes. To further this goal, the author suggests a total planning program which incorporates the full cooperation of private enterprise and government at all levels. This would enable all segments of the society to meet legitimate aspirations which would necessarily encompass a quality environment in addition to a healthy economy. (See also W71-07565) (Murphy-Rutgers)
W71-07570

STUDIES AND RESEARCH NEEDED IN REGULATION OF THE GREAT LAKES,
Wisconsin Univ., Milwaukee. Department of Energy, Mines and Resources, Ottawa (Ontario).
For primary bibliographic entry see Field 02H.
W71-07573

NEW REQUIREMENTS IN WATER RESOURCES PLANNING ON THE GREAT LAKES,
Great Lakes Basin Commission, Ann Arbor, Mich.
J. W. MacLaren, and R. F. Clevenger.
In: Great Lakes Water Resources Conference, Toronto, The Hydro-Electric Power Commission of Ontario, p 361-391, 1968.

Descriptors: *Great Lakes, *Water resources development, *Optimization, Water supply, Navigation, Hydropower, Irrigation, Agriculture, Fisheries, Recreation, Erosion, Watershed, Pollution, R and D, Government, Population, Technology.
Identifiers: *International Joint Commission, *Economic development, *Great Lakes Basin Commission, Power development.

A survey is presented of current conditions on the Great Lakes, stressing the multiple uses of the resource and the inter-effect of the various uses. The type of action needed for planning that permits optimum development of the resources on both the Canadian and United States sides of the border is discussed, particularly in light of the economic value of the resource to both economies. There is a discussion of such problems as water supply, water quality, waste disposal, navigation, power development, agricultural irrigation, fisheries, and recreation. A comprehensive plan for the staged development of the water resources of the Great Lakes is presented which attempts to determine the importance of the resource in economic development, the need for government support, the future requirements of the resource, and balanced utilization of available resources. Various suggestions are proposed for the implementation of such a plan, referring specifically to the Great Lakes Basin Commission and the International Joint Commission as monitoring agencies. (See also W71-07565) (Murphy-Rutgers)
W71-07574

ORGANIZATION AND PLANNING OF WATER QUALITY CONTROL,
Ontario Water Resources Commission, Toronto.
W. A. Steggles.
In: Great Lakes Water Resources Conference, Toronto, the Hydro-Electric Power Commission of Ontario, p 449-470, 1968.

Descriptors: *Water quality, *Great Lakes, *Water management, Government, Pollution, Drainage basin, Rivers, Sewers, Transportation, Population, Chloride, Waste treatment, Streams, Erosion, Canals.
Identifiers: *Quality control policy, *Economic incentives, Gross products.

The growing pollution problems of the Great Lakes are indicated; such problems are controllable by suitable planning, regulation and other procedures. This end could best be achieved by coupling water quality goals with economic incentives to reduce pollutants at the source. Greatly improved water pollution control technology is needed as the technology, economy, and standard of living increase in the Great Lakes area, as shown by such examples as gross products, human and animal populations, seaway and canal traffic, chloride content of lakes, and nutrients in Lake Erie. The three major areas of concern for appropriate water management are proposed as development of plans for optimal water use, study of tolerance for waste water, and a watch to detect unusual waste spills and overloads from treatment facilities. Various water quality objectives and standards are surveyed from both the Canadian and US viewpoints, and suggestions are presented for implementation of the new policies. (See also W71-07565) (Murphy-Rutgers)
W71-07576

SUGAR CANE IRRIGATION: A CASE STUDY IN CAPITAL BUDGETING,
McKinsey and Co., Inc., San Francisco, Calif.
Robert R. Champion, and George R. Glaser.
Management Science, Vol 13, No 12, B-781-B796, Aug 1967.

Descriptors: *Irrigation systems, Economic efficiency, Operating costs, Water supply, Operations research, Interest rate.
Identifiers: *Capital budgeting, Opportunity cost, Sensitivity analysis, Net Present Value, Payback, Cash flow.

This irrigation economics study is designed to recommend, on an agronomic and economic basis, a program for investing large amounts of capital in automatic and semiautomatic irrigation systems. Although this is a capital budgeting problem, the application of investment techniques was complicated by a wide range of climatic, topographic, and agronomic conditions. The author considered

homogeneous fields as blocks in order to reduce the number of investment alternatives. Then alternative irrigation systems were evaluated on a block-by-block basis using an investment analysis model and sensitivity tests. For ranking the returns of each alternative, the author used criteria of Net Present Value years to payback and source of water contribution. The analysis then proceeded with the estimates of costs and savings attributable to each alternative. (Siegenthaler-Rutgers)
W71-07578

EQUITY AND EFFICIENCY IN PUBLIC GOODS SUPPLY,
Dalhousie Univ., Halifax (Nova Scotia).
John G. Head.
Public Finance, Vol XXV, No 1, p 24-37, Nov 1970.

Descriptors: *Economic efficiency, Welfare economics, Resource allocation, Taxes.
Identifiers: *Equity, Social welfare function, Income redistribution, Public goods, Lump sum tax, Pareto criterion.

This paper considers Musgrave's treatment of the relationship between equity and efficiency in public goods supply. The two step framework for welfare maximization assumes an ideal income distribution and on the basis of this income distribution, public goods would be provided in accordance with individual preferences using a voluntary system of tax-prices. Musgrave finds that there is an indeterminary in public goods supply. The author suggests that this indeterminary does not exist and that Musgrave's conclusion as derived from the assumption that an initial ideal income distribution guarantees that the final distribution of welfare after public goods are supplied is also ideal. However, a formal solution to the problem of public goods supply is possible only if the ideal income distribution is defined in terms of the welfare maximum achieved after public goods have been supplied. The author finds that Musgrave's approach is equivalent to the social welfare function method but is more conducive to operationalization. This paper is relevant to water research concerned with the role equity and efficiency criteria in policy making. (Siegenthaler-Rutgers)
W71-07583

ON THE APPLICATION OF CARDINAL UTILITY THEORY TO ENGINEERING ECONOMIC ANALYSIS,
University of Southern California, Los Angeles.
Gerald Fleischer, and Robert H. Cremer.
The Engineering Economist, Vol 16, No 2, p 117-130, Winter 1971.

Descriptors: *Economic evaluation, Decision making, Cost-benefit analysis, Risk, Probability, Interest rate, Marginal utility, Discount rate.
Identifiers: *Cardinal utility, Cash flow, Rate of return, Present worth.

This paper considers the integration of cardinal utility concepts into the engineering economy methods of analysis and evaluation that are based on the manipulation of cash flow. The traditional concern with monetary quantities in the cash flow method is an oversimplication of relative project worth because the net utility of the project to the investors is neglected. The author outlines several of the key problems associated with establishing a specific utility function and suggests procedures for dealing with these difficulties when they occur in the public and private sectors. Several research questions are pointed out as needing further study; however, the author concludes at present a sufficient state of refinement does exist to include elements of utility theory into a conceptual framework for limited operationalism. This article is relevant to water research concerned with project evaluation and decision making. (Siegenthaler-Rutgers)
W71-07584

THE CONSIDERATION OF RISK AND UNCERTAINTY IN CAPITAL INVESTMENT ANALYSIS,
North Carolina State Univ., Raleigh.
J. R. Canada.
Management International, Vol 7, No 6, p 47-55, Dec 1967.

Descriptors: *Risk, Decision making, Economic evaluation, Budgeting, Mathematical model.
Identifiers: *Capital budgeting, Statistical decision theory, Risk discounting, Sensitivity study, Decision tree, Probabilistic monetary model.

This article surveys a wide variety of approaches or procedures that can be used to consider risk and uncertainty in capital budgeting analysis. The approaches are categorized into two groups according to the degree of sophistication involved. The basic traditional approaches discussed are assumed certainty, conservative adjusting, risk discounting, and sensitivity study. The author finds these related approaches to be quite limited in dealing with the consideration of risk. More advanced approaches such as the probabilities monetary, method, the decision tree, expected utility, and statistical decision theory are found to be more effective. The author concludes that these methods need further testing but do serve as a valuable supplement to administrative judgment. This article is relevant to water research concerned with project evaluation and water investment analysis. (Siegenthaler-Rutgers)
W71-07585

AN ANALYSIS OF APPLICATIONS OF THE UTILITY CONCEPT,
San Fernando Valley State Coll., Northridge, Calif.
Ernest H. Weinwurm.
The Engineering Economist, Vol 16, No 2, p 131-139, Winter 1971.

Descriptors: *Decision making, Risk, Economic evaluation, Mathematical model.
Identifiers: *Utility function, Opportunity cost, Planning-programming-budgeting, Subjective probability, Capital investment.

This paper considers the application of risk analysis and utility or preference theory to decision making models. The author first considers the conversion of qualitative data obtained from subjective behavior of managers to quanitative data. Then, the concept of risk analysis and utility theory is outlined along with a number of applications. The final section of the paper focuses on a recent study concerned with the explicit consideration of uncertainty in capital investment analysis. The approach is largely based on the normative decision model that combines subjective probability with the Von Neumann and Morgenstern utility theory. The author claims that two important improvements in the corporate decision process could result from a risk policy. First, it would help to avoid opportunity costs from rejecting prematurely risky projects and second it permits interpretation of risk information while satisfying the goal of maximizing expected utility. This article is relevant to budgeting and capital studies concerned with incorporating risk into water investment decision making. (Siegenthaler-Rutgers)
W71-07586

THE SYMMETRY APPROACH TO COMMITTEE DECISIONS: AN EMPIRICAL STUDY OF A LOCAL GOVERNMENT BUDGET COMMITTEE,
Wayne State Univ., Detroit, Mich.
Karl W. Roskamp, and Gordon C. McMelkin.
Zeitschrift fur die Gesamte Staats Wissenschaft, 126, Band I, p 75-96, Jan 1970.

Descriptors: *Decision-making, Economic evaluation, Uncertainty, Budget constraint, Resource constraint, Simulation.
Identifiers: *Symmetry of loss, Cardinal utility, Social utility function, Linear transformation.

This paper is concerned with the construction of operational decision models for the simulation of committee decisions. The authors present an empirical test of a modified version of the symmetry of loss approach using data from a local government's budget committee. This method permits one to derive from given individual cardinal utility functions a social utility function or committee utility function. Individual committee members were asked about their preferences with respect to budget size and composition and from these input, hypothetical budgets were generated using the symmetry of loss method. Comparison of the generated budget to the actual budgets revealed a high level of accuracy. The authors conclude that the symmetry approach should generate expenditure distributions close to actual results if the budget constraint is known or carefully estimated and if strategies and tradeoffs are considered. This paper is relevant to water research concerned with the decision making process and the expenditure implications of water investment decisions. (Siegenthaler-Rutgers)
W71-07588

SELECTING REGIONAL INFORMATION FOR GOVERNMENT PLANNING AND DECISION-MAKING,
California Univ., Los Angeles.
Werner A. Hirsch, and Sidney Sonenblum.
New York, Praeger, 1970. 198 p.

Descriptors: *Decision-making, Regional analysis, Economic evaluation, Cost-benefit analysis, Program budgeting, Economic efficiency, Resource allocation.
Identifiers: *Subnational information design, Social welfare, Horizon scanning.

This book is a revised version of one prepared for a Conference of the Committee on Regional Accounts of the Resources for the Future held in 1968. The purpose of the study is to develop a Subnational Information Design (SID) that will facilitate improved decisions at the state and national level. The information design is aimed at facilitating two kinds of decisions: horizon scanning decisions and preferred solution selection decisions. To assist the decision maker in horizon scanning decision-making, the information system can perfect alternative futures and also highlight the potential areas of concern. The analytical tool for preferred program selection is benefit-cost analysis within a program budgeting framework. The information system should be designed to aid in the development of a program budget and in the calculation of costs and benefits. The authors also describe the construction, mechanics, and alternative uses of an information retrieval system by decision-makers. This book is relevant to water planners concerned with the role of information systems in policy and program decisions. (Siegenthaler-Rutgers)
W71-07589

ON THE ASSESSMENT OF RISK,
Pennsylvania Univ., Philadelphia.
Marshall E. Blume.
The Journal of Finance, Vol XXVI, No 1, p 1-10, Mar 1971.

Descriptors: *Risk, Economic evaluation, Forecasting, Regression analysis, Covariance, Correlation.
Identifiers: *Beta coefficient, Portfolio approach, Bias, Capital budgeting.

This paper examines the statistical properties over time of one measure of risk, the coefficient of nondiversifiable risk (or the beta coefficient in investment analysis). The author defines the beta coefficient and presents a justification of its use as a measure of risk based on the empirical validity of the market model. After discussing the sample and its basic properties, the author examines the stationarity of this beta coefficient over time and then proposes a method of obtaining improved assessments of this measure of risk. The results of the em-

pirical analysis show a tendency for the estimated values of the risk measures to regress toward the mean. The author uses historical rates of regression for Beta to adjust the assessments for future risk coefficients and finds an improvement in the accuracy of the measurement of risk. This article is relevant for water studies concerned with the selection of alternative risky water investment projects. (Siegenthaler-Rutgers)
W71-07590

PORTFOLIO ANALYSIS, STOCK VALUATION AND CAPITAL BUDGETING DECISION RULES FOR RISKY PROJECTS,
New York Univ., N.Y.
Richard C. Stapleton.
The Journal of Finance, Vol XXVI, No 1, p 95-117, Mar 1971.

Descriptors: *Decision making, *Risk, Economic evaluation, Interest rate, Regression analysis, Economic efficiency.
Identifiers: *Capital budgeting, Net discounted value, Cash flow, Portfolio theory, Rate of return.

This paper derives capital budgeting decision rules based on stock value models derived within a portfolio framework when cash flows resulting from the acceptance of projects are risky. The stock value theory is used to derive optimal decision rules for the evaluation of individual capital projects. The decision rules are in terms of a project's discounted value and rate of return. Three different approaches to project evaluation are considered. The first method uses the probability distribution of the net discounted value (NDV) or the rate of return (RR) to derive the certainty equivalent (NDV) or the certainty equivalent (RR). The second method derives the same certainty equivalent values by computing the certainty equivalent cash flows of the project. The third approach uses the expected value of the cash flows of the projects and discounts these flows at a risk-adjusted discount rate to compute the (NDV). All three approaches yield the same accept-reject decision rules. This article is relevant for water resource studies concerned with capital budgeting and project evaluation. (Siegenthaler-Rutgers)
W71-07591

THE APPLICATION OF SYSTEMS ANALYSIS TO GOVERNMENT OPERATIONS,
George Washington Univ., Washington, D.C.
Guy Black.
New York, Praeger, 1969. 186 p.

Descriptors: *Systems analysis, Cost-benefit analysis, Risk, Marginal cost, Optimization, Linear programming, Input-output analysis, Discount rate.
Identifiers: *Cost effectiveness, Feedback theory, Sensitivity analysis, Present value.

This book considers the relation between the tools of the systems approach and the structure of systems concepts as related to government operations. Three major phases of the systems approach are discussed: systems analysis, systems engineering and systems management. Systems analysis establishes optimum system characteristics, analyzes interactions and studies the characteristics of the subsystems. The author uses cost-benefit analysis for identifying optimal system designs with the benefit function representing social benefits adjusted for risk. The relationship and distinctions between systems concept and Planning-Programming-Budgeting System are made. The National Park Service is used to illustrate how systems analysis takes account of externalities for both cost and benefit. This book is relevant to water administrators and researchers concerned with program analysis in terms of cost effectiveness. (Siegenthaler-Rutgers)
W71-07592

DECISION-MAKING ON TAXATION AND EXPENDITURES,
National Bureau of Economic Research, New York.
Charles E. Lindblom.
In: Public Budgeting and Finance, Itasca, F. E. Peacock Publishers, p 287-309, 1968.

Descriptors: *Decision-making, *Taxes, *Government, *Resource allocation, Cost-benefit analysis, Budgets, Costs, Minimization, Economic analysis, Welfare economics.
Identifiers: *Government expenditures, Normative economics, Means-end calculations, Overview, Fiscal policy.

This article presents an investigation for workable norms in decision-making processes. Two types of norms are dealt with, those for taxes and those for designers of decision-making machinery. The ultimate aim of the project presented is to make possible the eventual formulation of more workable standards for government tax and expenditure decisions through a refined aspect of normative economics. Characteristics of contemporary policy-making in government expenditures and taxation are first presented, dealing with budgetary difficulties and allocation of scarce resources. Norms such as objective clarification, deliberate choice, cost minimization, reasonable cooperation, and unified decision-making for interdependent events are collated from the policy presentation. The author then cites the discrepancy between these norms and actual practices, and suggests several possible solutions to these difficulties, including incremental decision-making, the bottleneck principle of scarce resource allocation, and coordination through partisan mutual adjustment. These principles, along with the analysis of the implications for the norms and principles discussed are relevant to the planning process of direct and indirect tax based water investments. (Murphy-Rutgers)
W71-07593

BUDGETING AND DECISIONMAKING PROCESS,
Harvard Univ., Cambridge, Mass.
Arthur Smithies.
In: Public Budgeting and Finance, Itasca, F. E. Peacock Publishers, p 253-261, 1968.

Descriptors: *Decision-making, *Federal government, *Budgeting, Resource allocation, Taxes, Budgets, Planning, Uncertainty, Economic analysis.
Identifiers: Policy objectives, Programming, Budget execution, Estimates.

This article presents the relation of budgeting to the process of governmental decision-making. Almost all government decisions have budgetary implications in that they involve allocating scarce resources among alternative uses. One primary purpose of the author is to establish that the entire decision-making process is greatly improved if these choices of allocation are made both explicitly and deliberately. The other primary goal of the author is to present a comprehensive discussion of the decision-making process, particularly the budgetary aspect, from the viewpoint of the structure and procedure of a complicated organization, namely the Federal government. Principles of organization are presented that can easily be applied in analysis of the specific problem of the Federal budget. Difficulties such as uncertainty are dealt with, and suggestions for optimally effective planning are proposed. These suggestions are of interest to those in the water resource planning field relating to resource allocation. (Murphy-Rutgers)
W71-07594

REGIONAL ALLOCATION OF PUBLIC INVESTMENT,
Tokyo Univ. (Japan).
Noboru Sakashita.
In: The Regional Science Association Papers, Vol 19, p 161-182, 1967.

Descriptors: *Investment, *Regional analysis, *Economic efficiency, Model studies, Capital, Economic analysis, Social aspects, Income, Optimization, Jobs, Taxes, Time.
Identifiers: *Public investment, *Regional allocation, *Efficiency criterion, Growth patterns, *Multiregion economy, Economic variables, Externalities.

This article deals with the problems of allocation of public funds by central governments to promote regional social capital formation. Lack of efficiency in such investment is ascribed to lack of interregional industrial complementarity and the political problems of such economic allocations. Two models are proposed to evaluate the effect of regional allocation of public investment on the growth pattern of a multiregion economy. The models differ concerning the presumptions on the productivity of public investment. Three properties of the optimal solution to the regional allocation problem result from the development and explanation of the models. These properties hold that public investment is justified since it originates outside the market mechanism, that public investment should be concentrated where the change in the values of relevant parameters is minimal, and that the optimum growth plan may call for utilizing several kinds of public investment policies. This paper is relevant to the analysis of the effects of public water resource investments on a regional economies. (Murphy-Rutgers)
W71-07595

PUBLIC INVESTMENT, THE RATE OF RETURN, AND OPTIMAL FISCAL POLICY,
Resources for the Future, Inc., Washington, D.C.
Kenneth J. Arrow, and Mordecai Kurz.
Baltimore, The Johns Hopkins Press, 1970. 218 p.

Descriptors: *Economic efficiency, *Planning, *Water resource development, Taxes, Discount rate, Optimization, Rate of return, Government, Capital, Financing, Management, Risk, Investment, Returns to scale, Cost-benefit analysis.
Identifiers: *Intertemporal criteria, *Resource allocation, *Controllability, Growth theory.

This book is an effort to remedy the inadequacy of existing theory of intertemporal criteria for resource allocation. It attempts to derive criteria for such allocation from dynamic notions of efficiency and then relates them to the macroeconomic problems of stability and growth. The book achieves a formulation of the problems of public expenditure in the context of modern economic growth theory by tying the determination of the allocation of resources between public and private sectors to the goal of getting the economic system onto an efficient growth path. The theory of public expenditure is developed by presenting an exposition of modern growth theory, and then developing a new theory of 'controllability'. The latter theory explores the question of whether or not the instruments of general fiscal control are sufficient to bring about an optimal intertemporal allocation of resources in the presence of constraints imposed by private behavior. The question of 'controllability' as presented here is relevant to those involved in water resource development and planning. (Murphy-Rutgers)
W71-07596

GENERAL THEORY: SOCIAL, POLITICAL, ECONOMIC, AND REGIONAL,
Pennsylvania Univ., Philadelphia.
Walter Isard, Tony E. Smith, Peter Isard, and Tze Hsiung Tung.
Cambridge, The M.I.T. Press, 1969. 1040 p.

Descriptors: *Decision-making, Operations research, Game theory, Systems analysis, Regional analysis, Input-output analysis, Linear programming.
Identifiers: *Location theory, Cardinal utility, Objective function, Payoff, Social welfare, General equilibrium.

This book presents a general theory on the social, political, and economic structure and functions of regions and develops this theory in the framework of decision-making analysis. The book contains materials of three kinds: location theory, decision theory, and general social systems theory. The authors introduce information and decision processes into location theory and consider the problem of the optimal spatial allocation of information and decision-making. The game theory approach to locational decision problems is also treated and illustrated with extensions beyond cost minimization and welfare maximization solutions. Instead, the location analysis does not separate the problems of distribution of gains and efficient allocation but considers the possibility of negotiable alternatives in the analysis. This book is relevant to water studies concerned with reviewing the broad theoretical basis of decision-making techniques and regional planning. (Siegenthaler-Rutgers)
W71-07597

PLANNING FOR WATER IN AN URBAN AGE,
Guy J. Kelnhofer.
Paper delivered at Clemson University, 12 Feb 1970. 12 p.

Descriptors: *Planning, *Water resources, *Urbanization, *Management, Land resources, Coordination, Water supply, Technology, Communication, Decision-making, Manpower, Professional personnel.
Identifiers: *Metropolitan water resource management, Urban age.

It is pointed out that America is now in an urban age and that all types of planning must reflect this fact. This is particularly true of water planning, where a transition from a rural to an urban orientation need to be made. A number of salient porblems of this transition can be identified. (1) We must find more responsive and more efficient means of defining the interests of metropolitan areas in the water and related land resources serving their communities. (2) The problem of bringing together, under one common mangement system, all of the related functions of water in a metropolitan area is one which becomes more urgent as the demand on urban water supplies increasingly exceeds existing management capabilities. (3) We must find ways to put our new knowledge to use more rapidly. (4) We must produce larger numbers of trained resource planners. (5) We must find ways to communicate with the man in the street and elected officials on all levels. (6) We must devise improved systems of public decision-making. (Davis-Chicago)
W71-07688

QUANTITATIVE WATER RESOURCE BASIN PLANNING: AN ANALYSIS OF THE PECOS RIVER BASIN, NEW MEXICO,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 04B.
W71-07691

PREDICTION OF WATERSHED DEVELOPMENT SUCCESS OF LOCAL COMMUNITIES,
Department of Agriculture, Upper Darby, Pa. Economic Research Div.
P. Thomas Cox.
Reprint, In: International Conference on WATER FOR PEACE, May 23-31, 1967. 15 p, 3 tab, 5 ref.

Descriptors: *Methodology, *Planning, *Watershed management, Water resources development, Social aspects, Political aspects, Community development.
Identifiers: *Discriminant analysis, Community performance.

Few analyses have been made of the performance of communities engaged in water development projects within a free society. It is usually assumed that, once informed of the possible benefits, local citizens will quickly adopt proposed water development projects. In order to investigate this assumption an analysis of the differences in performance of local communities in achieving developmental goals was undertaken. The discriminant analysis technique utilized provides a method of classification of watersheds into groups representing fast to slow accomplishment of watershed development. It provides a test of significance of these groupings. It also provides classification coefficients to predict, based upon the performance of the original sample, the behavior of subsequent watersheds for which data on the same variables are available. Investigation of the classified watersheds according to type of sponsorship and pattern of relationships among certain variables or measures should help explain why some of the socio-economic variables affect rate of progress in watershed development. Recommendations as to type of sponsorship given certain relationships can then be advanced for future development projects. (Davis-Chicago)
W71-07694

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

STUDIES IN THE ANALYSIS OF METROPOLITAN WATER RESOURCE SYSTEMS, VOLUME I, THE LONG RUN EFFECTS OF WATER PRICING POLICIES,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 06A.
W71-07059

SOME ASPECTS OF WATER PRICING IN NON-INDUSTRIAL COMMUNITIES,
Florida Univ., Gainesville. Dept. of Economics.
C. W. Fristoe, F. O. Goddard, and N. G. Keig.
Land Economics, Vol 47, No 1, p 87-92, Feb 1971. 4 ref, 1 fig.

Descriptors: *Rates, Municipal use, Sprinkler irrigation, Lawns, Cost allocation.

In attempting to discuss ways of dealing with the effect of lawn irrigation on water pricing and cost, the authors advocate water use restrictions in order for water utilities to pursue a policy of charging the users of a water service the full cost of supplying it. Since lawn sprinkling substantially raises the maximum day and peak-hour rates of water delivery as well as concentrating the highest levels of water consumption into one season, imposing restrictions on the use of water for lawn irrigation 'would best promote the public interest.' (Holmes-Rutgers)
W71-07496

COST OF PUMPING IRRIGATION WATER IN ARIZONA: 1891 to 1967,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
Thomas Archer, and William E. Martin.
Water Resources Research, Feb 1971, Vol 7, No 1, p 23-31. 5 fig, 1 tab, 32 ref.

Descriptors: *Irrigation practices, Operating costs, Water rates, Cotton, *Arizona.
Identifiers: Pinal County (Ariz), Agricultural Experiment Station.

The historical record of the cost of pumping groundwater in Arizona is examined. Costs are presented in actual dollars and dollars adjusted by GNP implicit price deflators. Whereas pumping depths have been rising rapidly, costs per acre-foot per foot of lift have been falling, adjusted costs per acre-foot have been almost constant, and per acre costs and total farm costs relative to both total costs and total returns have fluctuated throughout the time period examined, sometimes being lower but often being higher than costs at the present time. (Holmes-Rutgers)
W71-07501

ECONOMIC ANALYSIS OF SEWER SERVICE CHARGE FORMULAS,
McMasters Univ., Hamilton (Ontario). Dept. of Economics.
J. A. Johnson.
Land Economics, Feb 1971, Vol 47, No 1, p 80-86. 1 tab, 8 ref.

Descriptors: *Sewage systems, Economics, *Cost comparisons, *Rates, Evaluation, Costs.
Identifiers: *Joint Committee Formula, *Sewer service charge.

This paper analyzes the most important types of sewer service charge formulas. It judges these six different types in terms of equity, economic efficiency, revenue adequacy, and administrative simplicity. The advantages and disadvantages of each type of system for different municipalities are described and analyzed. (Holmes-Rutgers)
W71-07502

A GROWING MARKET FOR WATER AND WASTE WATER TREATMENT EQUIPMENT,
For primary bibliographic entry see Field 05D.
W71-07539

FUNDING FOR AGRICULTURAL WASTE RESEARCH,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 05D.
W71-07554

EFFLUENT CHARGES: A METHOD OF ENFORCING STREAM STANDARDS,
Maine Univ., Orono.
Orlando E. Delogu.
Maine Law Review, Vol 19, p 29-47, Jan 1967.

Descriptors: *Water pollution control, Water quality, Pollution abatement, Resource allocation, Sewer treatment facility, Water supply.
Identifiers: *Effluent charge, Stream standard, Externalities, User charge, Transfer payment.

The use of effluent charges are considered a means of achieving stream standards defined by the state and Federal government. The effluent charge system would shift the cost burden of the presently employed means of waste disposal from the state and downstream users to the economic unit creating the waste product. The effluent charge system corrects the market distortions created by the present system of waste disposal but it does not improve water quality. The author suggests that effluent charges can be used to achieve water quality standards by using the money collected from effluent charges for the construction and operation of sewer treatment facilities. This modified effluent charge proposal combines the state's power to tax with the municipal waste land surcharge to provide an enforcement mechanism for the achievement of water quality standards. (Siegenthaler-Rutgers)
W71-07577

6D. Water Demand

A STUDY TO EVALUATE POTENTIAL SOLUTIONS TO THE PROBLEM OF INSURING AN ADEQUATE WATER SUPPLY FOR NEW CASTLE COUNTY, DELAWARE.
University City Science Inst., Philadelphia, Pa.
For primary bibliographic entry see Field 03B.
W71-07064

WATER RESOURCES PLANNING STUDY FOR ARKANSAS AND OKLAHOMA,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W71-07135

THE ARIZONA LETTUCE INDUSTRY: COMPETITION, PRICES, DEMAND, SUPPLY CONTROL,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 03F.
W71-07162

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
For primary bibliographic entry see Field 04A.
W71-07167

WATER AND SEWER PLAN AND PROGRAM, 1970.
Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 05D.
W71-07202

WATER FOR CALIFORNIA--OUTLOOK IN 1970.
California State Dept. of Water Resources, Sacramento.

Available from: State of California, Documents Section, PO Box 20191, Sacramento, Calif, 95820, Price $5.00. California Department of Water Resources Bulletin No 160-70, Dec 1970. 179 p, 42 fig, 2 plate, 14 tab.

Descriptors: *Water resources development, *California, *Projects, *Reviews, Planning, Evaluation, Water quality, Urbanization, Land development, Economics, Agriculture, Recreation, Population, Legislation, Wildlife, Electric power demand, Surface waters, Groundwater, Hydrogeology, Watershed management.

Appraisals of water demands for various beneficial purposes throughout the State of California for 1990 and 2020, and the potential sources of water supplies to satisfy those demands are presented. Accomplishments in both planning and water development implementation in the four years since 1966 is discussed. Urban land use is expected to nearly double from 2.3 million acres at present to about 4.5 million acres in 2020 to accommodate the projected population of 45 million. Statewide urban water demands are expected to increase from about 3.7 million acre-feet at present to 6.4 million acre-feet in 1990 and 10.3 million acre-feet in 2020. Overall per capita water demands are expected to increase some 20 percent by 2020. Demands for agricultural water will increase from 24.4 million acre-feet at present to 27.4 million acre-feet in 1990, and 28.7 million acre-feet in 2020. All major urban areas have adequate water supplies from existing projects or facilities authorized or under construction to meet water demands for the next 20 or more years. (Woodard-USGS)
W71-07296

HYDRO-ELECTRIC POWER DEVELOPMENT ON THE GREAT LAKES SYSTEM,
Hydro-Electric Power Commission of Ontario, Toronto.
For primary bibliographic entry see Field 06B.
W71-07566

6E. Water Law and Institutions

THE UNIVERSITY'S ROLE IN NATIONAL WATER POLICY.
For primary bibliographic entry see Field 06B.
W71-07183

THE LAW PERTAINING TO ESTUARINE LANDS IN SOUTH CAROLINA,
William A. Clineburg, and John E. Krahmer.
South Carolina Law Review, Vol 23, No 1, p 7-24, 1971. 68 ref.

Descriptors: *South Carolina, *Estuaries, *Coastal marshes, *Tidal marshes, Estuarine environment, Estuarine fisheries, Tides, Salt marshes, Marsh management, Land tenure, Legal aspects, Water law, Administration, Administrative agencies, Phosphates, Fishing, State governments.

Evaluated in this article is the law relating to estuarine lands in South Carolina. Estuarine areas are defined as those coastal areas where fresh water from the land meets the salt water of the sea with a daily tidal flow. Estuarine fishing, residential development, and phosphate mining are discussed. The historical development of the law of estuarine ownership during the following periods is examined: (1) under English common law, (2) the colonial period, (3) 1777-1928, (4) 1928-1951, and (5) 1952-1969. In South Carolina estuarine lands are owned by the state, and they are not subject to sale by the Budget and Control Board. They probably are not subject to general sale by the legislature. The legislature can confirm titles to individual pieces of estuarine land and may be able to sell specific tracts by special acts. The problem of managing these lands is complex as there are eight state agencies now administering various aspects of this land. Several agencies of the federal government have duties of control which affect estuarine lands in South Carolina. The author concludes by recommending reorganization of the present administrative structure, perhaps creating a single agency with authority over estuarine lands. (Robinson-Florida)
W71-07208

SUBSIDENCE RESULTING FROM THE REMOVAL OF GROUNDWATERS,
Robert H. Steelhammer, and John G. Garland.
South Texas Law Journal, Vol 12, No 2, p 201-213, 1970. 88 ref.

Descriptors: *Land subsidence, *Percolating water, *Damages, *Water sources, Settlement (Structural), Withdrawal, Subsidence, Percolation, Underground streams, Subsurface waters, Underground, Legal aspects, Water law, Underflow, Groundwater basins, Water rights, Land tenure.

Evaluated in this article are the legal aspects of the problem of subsidence resulting from the removal of underground waters. All underground waters are presumed to be percolating waters in the absence of contrary evidence. There are two conflicting legal doctrines dealing with percolating waters. The English Rule considers percolating water as much a part of the freehold as minerals, and the owner, in the absence of malice, has the absolute right to intercept the water regardless of any effect on his neighbor's land. The American Rule requires that the use of percolating waters must be reasonably necessary for some beneficial purpose. The application of these rules is discussed in light of several cases. Generally each landowner is entitled to lateral support of his neighbor's land irrespective of negligence. The Restatement of Torts has adopted a provision stating that one who is privileged to withdraw underground water is not for that reason privileged to cause a subsidence of the others land. The damages for such a subsidence are the natural, ordinary, or reasonable consequences of the removal of subjacent support. The author concludes that the Restatement position is a valuable step forward. (Robinson-Florida)
W71-07209

ADJUDICATION OF FEDERAL RESERVED WATER RIGHTS,
John C. Guadnola.
University of Colorado Law Review, Vol 42, No 2, p 161-172, 1970. 64 ref.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Federal jurisdiction, *State jurisdiction, Water rights, Colorado, Legislation, Water supply, Legal aspects, Judicial decisions, Conservation, Appropriation, Appropriation doctrine, Preferences (Water rights), Priorities, Adjudication procedure, Water utilization, Consumptive use, Land.
Identifiers: *McCarran Amendment.

Recently, the Supreme Court of Colorado in United States v. District Court (458 P 2d 760, cert. granted, 38 U.S.L.W. 3379 (U.S. Mar. 30, 1970, No. 1178) asserted jurisdiction to adjudicate federal reserved water rights. This note discusses the Colorado decision, offering support for its holding on the jurisdiction issue and suggesting a way in which any decision on the merits can accommodate the interests of private appropriators and the federal government. The principle obstacle to jurisdiction over federal water rights is sovereign immunity. The only federal legislation waiving such immunity is the McCarran Amendment (43 U.S.C. S 666, 1964), of rights to waters of river systems or other sources, or (2) where the United States owns or is in the process of acquiring water rights by one of several enumerated methods and is a necessary party. The note first considers the Colorado court's reasoning in finding jurisdiction and finds it inadequate. The author then puts forward his own theory, arguing chiefly that since reserved rights are open-ended, private appropriators should have recourse to state adjudication concerning the future availability of water. Nevertheless, state courts must be careful to protect federal interests. The note concludes with a discussion on how this can be accomplished. (Duss-Florida)
W71-07210

PERMITS FOR DISCHARGES OR DEPOSITS INTO NAVIGABLE WATERS.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 36, No 56, Tuesday, March 23, 1971, p 5431-5432.

Descriptors: *Navigable waters, *Permits, *Water pollution, *Regulation, Administration, Federal government, Legislation, Water pollution sources, Water quality, Public health, Water pollution control, Inspection, Environment, Environmental effects, Water Quality Act, Administrative agencies, Water quality control.

In this entry in the Federal Register, the Department of the Army, Corps of Engineers, sets forth proposed regulations for issuance of permits for discharges or deposits into navigable waters. The draft permit first identified the nature of the deposit or discharge approved and any limitations on its character or quality. General conditions governing the permit outline regulations, policies, and procedures to be followed by permittees. Penalties that can be invoked upon violation of terms and conditions of permits are listed. Permittees shall comply with applicable state or federal water quality standards. Procedures to be followed when water quality standards become more rigorous are outlined. Permittees shall comply with any regulations or directives issued by the Administrator of the Environmental Protection Agency and with recommendations of any enforcement conference held pursuant to the Federal Water Pollution Control Act. Provisions cover inspection of discharge facilities by the Corps and records to be kept by permittees. The public shall have access to all information concerning specific permits. Other provisions cover: (1) taxation or charges on deposits or discharges; (2) prohibition of construction of facilities on navigable waters; (3) suspension, modification or revocation of permits; and (4) duration of permits. (Duss-Florida)
W71-07211

GRANTS FOR WATER POLLUTION CONTROL.
Environmental Protection Agency, Washington, D.C.

Federal Register, Vol 36, No 59, Friday, Mar 26, 1971, p 5713.

Descriptors: *Water pollution control, *Water pollution, *Waste treatment, *Government finance, Treatment facilities, Waters pollution treatment, Costs, Regulation, Administrative agencies, Administration, Water quality, Environment, Cities, Municipal wastes, Water pollution sources.
Identifiers: *Environmental Protection Agency.

In this entry in the Federal Register, The Environmental Protection Agency (EPA) serves notice that it proposes to amend its regulations to establish regulations for the administrator of the EPA to reallocate funds appropriated for states for construction of waste treatment facilities. The first part of the amendment presents formulas for determining the amount of the allotment to be given during the fiscal year. The second part of the amendment concerns the reallotment of funds to states where they have not been obligated within the time specified by law. Procedures which states must follow in order to be entitled to any reallotment are outlined. Prior to making any reallotment, the Administrator may determine whether any unobligated funds should be applied to situations of special need. In making such a determination the Administrator shall consider the extent: (1) of degradation of water quality, (2) of financial need, (3) of degradation attributable to untreated or inadequately treated waters of municipalities, (4) to which facilities to be constructed will contribute to the enhancement of the environment, and (5) other relevant factors. (Duss-Florida)
W71-07212

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 36, No 59, p 5751 (Mar 1971). 1 p.

Descriptors: *Water pollution sources, *Water pollution control, *Oil, *Regulation, Administrative agencies, Administration, Federal government, Legislation.
Identifiers: *Federal Water Pollution Control Act.

In this entry in the Federal Register, the Federal Maritime Commission states that any vessel subject to the financial responsibility provisions of the Federal Water Pollution Control Act and its implementing regulations will be deemed to be in substantial compliance with these requirements if it has filed an application for a Certificate of Financial Responsibility and submitted required evidence even if it does not carry its certificate on board. The notice lists information which masters of vessels without certificates aboard should have available for the Commission. (Duss-Florida)
W71-07213

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 36, No 59, Friday, Mar 26, 1971, p 5703-5704.

Descriptors: *Administrative agencies, *Administration, *Oil, *Ships, Water pollution sources, Water pollution, Water pollution control, Legislation, Federal government, Costs, Regulation.
Identifiers: *Federal Water Pollution Control Act.

Under the Federal Water Pollution Control Act as amended (84 Stat. 97), owners or operators of ships of certain sizes must have evidenced financial responsibility for potential oil pollution cleanup costs. The Federal Maritime Commission has authority to promulgate rules and regulations implementing this requirement and in this entry the Commission sets forth amendments to regulations relating to certification of financial responsibility. The first amendment relaxes the requirement that certificates be carried on board vessels. The new rule requires that where it is physically impossible to carry the certificate on board the vessel, the certificate number shall be displayed on both bows of the vessel or barge. The second amendment provides for issuance of master certificates to an owner's or operator's entire fleet of vessels. This amendment provides that in lieu of separate certificates persons owning or operating vessels as builders, scrappers, or sellers may apply for a master certificate to cover all vessels up to a specified individual vessel tonnage. Procedures are outlined for complying with this rule. (Duss-Florida)
W71-07214

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

FINANCIAL RESPONSIBILITY FOR OIL POLLUTION CLEANUP.
Federal Maritime Commission, Washington, D.C.

Federal Register, Vol 35, No 204, Tuesday, Oct 20, 1970, p 16374-16375.

Descriptors: *Oily water, *Pollution abatement, *Water quality control, *Water pollution control, Oil, Oil wastes, Pollutants, Administration, Administrative agencies, Administrative decisions, Regulation, Federal government, Navigable waters, Navigation, Water quality, Water pollution, Legal aspects, Financing.

Pursuant to the Water Quality Improvement Act of 1970, the Secretary of the Federal Maritime Commission proposes this regulation dealing with financial responsibility for oil pollution cleanup. Every application for a Certificate of Financial Responsibility shall be accompanied by an application fee of $100 which is non-refundable. A certification fee is also required for each vessel; this fee shall be either $5.00, $10.00, $15.00, or $20.00 depending on the size of the vessel. Fees are to be made payable in United States dollars and may be paid by check, draft, or postal money order made payable to the Federal Maritime Commission. (Robinson-Florida)
W71-07216

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Federal Register, Vol 35, No 227, Saturday, November 21, 1970, p 17944-17946. 2 tab.

Descriptors: *Oily water, *Pollution abatement, *Water pollution control, *Water quality control, Oil, Oil wastes, Pollutants, Regulation, Administration, Administrative decisions, Administrative agencies, Federal government, Water policy, Water pollution, Water quality, Navigable waters, Navigation, Legal aspects.

Pursuant to the Federal Water Pollution Control Act as amended by the Water Quality Improvement Act of 1970, providing for prevention, cleanup, enforcement, and penalties relating to the discharge of harmful amounts of oil into navigable waters of the United States, the Commandant of the Coast Guard herein promulgates procedures to be followed in the event of such discharges. The Coast Guard has been delegated the authority to assess civil penalties for violation of the statutue or regulations. Any Coast Guard commissioner, warrant, or petty officer is authorized to enforce these regulations. Any person in charge of a vessel or onshore or offshore facility shall notify one of the following officials immediately upon learning of a harmful discharge: (1) the commanding officer of any nearby Coast Guard unit, (2) the commander of the appropriate Coast Guard District, or (3) the federal official designated as the on-scene commander for spill-response purposes. If none of the above can be reached, then either the Commandant of the Coast Guard or the Regional Director of the Federal Water Quality Administration shall be notified. Addresses and phone numbers of certain concerned officials are listed. (Robinson-Florida)
W71-07217

DISCHARGE OF OIL.
Federal Register, Vol 35, No 177, Friday, September 11, 1970, p 14306-14307.

Descriptors: *Oily water, *Pollution abatement, *Water pollution control, *Water quality control, Oil wastes, Oil, Pollutants, Regulation, Administration, Administrative agencies, Administrative decisions, Navigable waters, Water pollution, Water pollution sources, Water quality, Water resources, Legal aspects, Federal government.

Pursuant to section 11 (6) (3) of the Federal Water Pollution Control Act, these regulations pertaining to the discharge of oil are adopted. The regulations apply to the discharge of oil into or upon the navigable waters of the United States or the contiguous zone. Harmful discharges include those which: (1) violate applicable water quality standards, (2) discolor or cause a film or sheen upon the water, or (3) cause a sludge to be deposited beneath the surface of the water. No person shall discharge or cause to be discharged any oil in harmful quantities into the navigable waters of the United States or the contiguous zone. Discharges of oil from a properly functioning vessel engine are not considered harmful, but oil accumulated in the bilges is not exempt. The addition of dispersants or emulsifiers to discharged oil, which would circumvent those regulations, is prohibited. Any person in charge of any vessel or onshore or offshore facility shall notifiy the Coast Guard immediately upon learning of any prohibited discharge. (Robinson-Florida)
W71-07218

ENVIRONMENTAL EDUCATION ACT (NEED FOR EDUCATION CONCERNING ENVIRONMENTAL QUALITY AND ECOLOGICAL BALANCE).
Pub L No 91-516, 84 Stat 1312, 13 US Code Cong and Admin News, p 5353-5357 (1970). 5 p.

Descriptors: *Environment, *Environmental effects, *Education, *Administration, Administrative agencies, Federal government, Legislation, Ecology, Balance of nature, Pollution, Technology, Rural areas, Community development, City planning, Population, Conservation, Resources, Resource development, Government finance, Projects, Public health.

Because of the deterioration in the quality of our environment and its ecological balance, the threat this poses to the public, the poor understanding of the public about environmental issues, and the presently inadequate resources for educating the public about environmental quality, Congress herein enacts the Environmental Education Act. The Act's purpose is to provide broad support for educational programs and projects designed to inform the public about the environment and to enhance environmental quality and maintain the ecological balance. The Act establishes within the Office of Education an office of environmental education to administer the programs authorized by this legislation. Environmental education is defined as the educational process dealing with man's relationship to his natural and manmade surroundings. This includes the relationship between: (1) population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning and (2) the total human environment. Provisions authorize the making of grants for education projects and describe activities qualified for funds and criteria for approval of applications for financial assistance. An Advisory Council on Environmental Education is established to assist in the administration of the Act. Other provisions deal with technical assistance by federal agencies, small grants, and authorized appropriations. (Duss-Florida)
W71-07219

LEGISLATION FACILITATING NEGOTIATION OF AN INTERSTATE COMPACT RESPECTING THE HUDSON RIVER.
Pub L 89-605, 80 Stat 847-849 (1966). 3 p.

Descriptors: *Hudson River, *Interstate compacts, *New York, *New Jersey, Vermont, Connecticut, Massachusetts, Rivers, Running waters, Surface waters, Interstate rivers, Legal aspects, Federal government, State governments, Local governments, Water pollution control, Water utilization, Water resources, Water resources development, Legislation.

Under this federal statute the states of New Jersey, Vermont, Massachusetts, and Connecticut may negotiate with each other and the United States for the purpose of establishing a compact dealing with the preservation, restoration, utilization, and development of the natural, scenic, historic, and recreational resources of the Hudson River. The Secretary of the Interior shall represent the United States in such negotiations and report to the President not later than July 1, 1968. In negotiating the compact the following shall be considered: (1) encouragement of all beneficial uses of the lands and waters of the riverway; (2) encouragement of local and state autonomy in planning and action; (3) the need to abate water pollution; (4) the need to preserve, enhance, and rehabilitate the scenic beauty of the riverway; (5) the need to protect fish and wildlife; and (6) the need to preserve and develop archeological and historic sites. All departments, agencies, and instrumentalities of the United States shall consult with the Secretary of the Interior concerning any plans affecting the Hudson River until such time as the states and the United States have had an opportunity to negotiate a compact. (Robinson-Florida)
W71-07220

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
H R Rep No 127, 91st Cong, 2d Sess, 4 US Code Cong and Admin News p 809-830 (1970). 22 p.

Descriptors: *Water quality control, *Environment, *Administrative agencies, *Pollution abatement, Pollutants, Oil, Oil industry, Water pollution, Water pollution control, Water pollution sources, Water quality, Administration, Federal government, United States, Ships, Sewage, Sewage disposal, Legislation, Legal aspects, Ecology.
Identifiers: *Water and Environmental Quality Improvement Act of 1970.

The legislative history of the Water and Environmental Quality Improvement Act of 1970 is set forth in this House report. Part I of the report discusses the problems to be corrected by the legislation, while part II delineates the effect of specific sections of the Act. The first topic discussed concerns the control of pollution by oil and other matter, noting the Torrey Canyon disaster and the Santa Barbara Channel oil spills and determining that present legislation is inadequate to deal with such situations. A discussion of oil pollution considers the effect of the Act upon financial responsibility and liability for oil spills. The topic dealing with control of sewage from vessels shows committee awareness of the antiquity of vessels in the United States merchant fleet and allows a reasonable margin for such vessels to continue operation under the new standards. The remaining topics are concerned with area acid and other mine water control demonstrations and cooperation by federal agencies pollution control, including appropriations for the new program. Part II provides a section-by-section explanation of the bill as it pertains to each of the foregoing problem areas, and contains a section on training personnel in water quality control. (Hart-Florida)
W71-07221

ENVIRONMENTAL FINANCING ACT OF 1971 (A BILL TO ESTABLISH AN ENVIRONMENTAL FINANCING AUTHORITY TO ASSIST IN THE FINANCING OF WASTE TREATMENT FACILITIES).

Senate Bill 1015, 92d Cong., 1st Sess (1971). 11 p.

Descriptors: *Construction costs, *Waste treatment, *Treatment facilities, *Government finance, Water pollution control, Pollution abatement, Legislation, Federal government, State governments, Local governments, Cities, Administration, Cost sharing, Cost repayment, Capital costs, Financing, Interest, Debt, Loans, Repayment contracts, Government supports, Grants, Administrative agencies, Legal aspects.
Identifiers: *Water Pollution Control Act, *Environmental Financing Act.

The Environmental Financing Act of 1971 would assure that the inability to borrow necessary funds on reasonable terms does not prevent any state or local public body from carrying out projects for construction of waste treatment works. An Environmental Financing Authority would be established and authorized to purchase, on terms and conditions determined by the Authority, any obligation which is issued by a state or local public body to finance the non-federal share of the cost of any project for the construction of waste treatment works which have been determined to be eligible for federal financial assistance under the Federal Water Pollution Control Act. To obtain assistance, a public body must be unable to obtain on reasonable terms sufficient credit to finance its actual needs. Initial capital for the Authority is provided, along with capacity to issue obligations, general powers, tax exemption, and administrative regulations. Pursuant to this Act other federal acts would be amended as necessary. (Smiljanich-Florida)
W71-07222

DETERGENT POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO ESTABLISH STANDARDS AND PROGRAMS TO ABATE AND CONTROL WATER POLLUTION BY SYNTHETIC DETERGENTS).

Senate Bill 75, 92d Cong, 1st Sess (1971). 14 p.

Descriptors: *Detergents, *Pollution abatement, *Phosphates, *Water quality control, Chemical wastes, Domestic wastes, Industrial Wastes, Water pollution sources, Water pollution effects, Federal government, Adoption of Practices, Legislation, Alkylbenzene sulfonates, Eutrophication, Biodegradation, Toxicity, Public health, Sewage treatment, Standards, Regulations, Adjudication procedure, Administrative agencies, Interstate, Industrial production, Legal aspects.

The Detergent Pollution Control Act of 1971 would establish standards and programs to abate and control water pollution by synthetic detergents. Recent studies demonstrate the extent to which polyphosphates in detergents contribute to water pollution due to eutrophication and toxicity caused by their nondegradability. This Act would require the use of non-polluting, safe substitutes for detergent polyphosphates in order to protect lakes and rivers from further pollution from this source. The Administrator of the Environmental Protection Agency would be authorized to establish standards of water eutrophication ability, biodegradability, toxicity, and of effects on the public health and welfare which must be met by all synthetic detergents, according to the procedures prescribed herein. Any detergent which after a future date does not conform with the standards would be prohibited from introduction or delivery into interstate commerce. Criminal penalties are provided, along with procedures for the enforcement of the standards. Appropriations would be made for research and development of pollution-free detergents. (Smiljanich-Florida)
W71-07223

A BILL TO ASSIST THE STATES IN ESTABLISHING COASTAL ZONE MANAGEMENT PLANS AND PROGRAMS.
Senate Bill 638, 92d Cong, 1st Sess (1971). 19 p.

Descriptors: *Coasts, *Water resources development, *Water quality control, *Cost sharing, Federal government, State governments, Legislation, Oceans, Continental Shelf, Estuaries, Estuarine environment, Aquatic environment, Pollution abatement, Water management (Applied), Administration, Planning, Project purposes, Administrative agencies, State jurisdiction, Federal project policy, Financing, Industrial production, Inter-agency cooperation, Geographical regions, Legal aspects.

The coastal states need encouragement and assistance in exercising effectively their responsibilities over the coastal zone through the preparation and implementation of management plans and programs to achieve wise use of the coastal zone through a balance between development and protection of marine resources. To assist the states in establishing coastal zone management plans and programs, this amendment to a prior Act (16 USC 1121 et seq) would authorize grants for a portion of the cost. The Secretary of Commerce would be authorized to make annual grants to any coastal state for the purpose of assisting in the development and administering of such programs. The grants would not exceed one half of the cost to any state. The Secretary would examine the plans prior to granting approval, and would promulgate rules and regulations necessary for the provisions of the Act. A coastal zone management advisory committee would advise the Secretary on matters of policy concerning the coastal zones. Provisions are included for inter-agency cooperation, annual reports, and appropriations. (Smiljanich-Florida)
W71-07224

FUNCTIONS OF CORPS OF ENGINEERS IN ISSUING PERMITS FOR WORK IN NAVIGABLE WATERS.
33 Code of Federal Regulations, Sec 209.120 (1970). 8 p.

Descriptors: *Administrative agencies, *Administration, *Navigable waters, *Construction, Permits, Regulation, Navigation, Fish, Wildlife, Conservation, Water pollution, Ecology, Federal government, Navigable rivers, Harbors, Piers, Dams, Dikes, State governments, Flood control, Prospects, Recreation, Water policy, Legal aspects, Channels.

Outlining the administrative procedure under which the Corps of Engineers operates, this federal regulation describes the Corps' functions, jurisdiction, and policies in granting permits for work in navigable waters. The Corps supervises river, harbor, and flood control improvements authorized by law and administers certain laws for the protection and preservation of navigation and navigable waters in the United States. The regulation lists the principal laws concerning navigation and navigable waters over which the Corps has jurisdiction. Most of these laws relate to various types of construction on waterways and improvements in navigable rivers. The Chief of Engineers of the Corps has been authorized to delegate authority to district engineers to issue permits for work done in or over navigable waters. Procedures for obtaining permits are outlined. The general policy for issuing permits rests on an evaluation of all relevant factors, including the effect of the proposed work on navigation, fish and wildlife, conservation, pollution, aesthetics, ecology, and the general public interest. Other provisions describe the relation between the Corps and other authorities in issuing permits and issuance of permits where proposed improvements may effect flood control projects, coastal waters, the flow of water, water quality, or other aspects of navigation. (Duss-Florida)
W71-07225

PIERS, DREDGING, ETC, IN WATERWAYS.
33 Code of Federal Regulations, Sec 209.130 (1970). 11 p.

Descriptors: *Dredging, *Piers, *Administrative decisions, *Permits, Channel improvement, Engineering structures, Docks, Abutments, Federal government, Administration, Legal aspects, Administrative agencies, Regulation, Water resources, Water policy, Engineering, Navigation, Navigable waters.

Application for a permit to construct piers or dredge in waterways consists of a letter requesting the permit accompanied by maps and plans of the proposed work. This letter is submitted to the District Engineer in charge of the concerned locality. While there is no prescribed form, the letter must contain the following: (1) address of applicant, (2) date, (3) name of the waterway, (4) location of work, (5) description of work, and (6) a statement as to whether the work is within the corporate limits of a municipality. Responsibilities of the District Engineer are specified in this regulation. The preparation of maps and plans is also explained. The contents of permits are discussed, pointing out the responsibilities of the parties. Specification for electrical transmission lines are detailed. Generally applicants have three years to complete work, but extensions may be granted. If future operations by the United States require an alteration in the position of the structures or work or if, in the opinion of the Secretary of the Army, it would cause unreasonable obstructions to navigation, the owner will be required to remove the obstruction without expense to the United States. (Robinson-Florida)
W71-07226

WHAT'S AHEAD FOR OUR PUBLIC LANDS,
Hamilton K. Pyles.
Washington, Natural Resources Council of America, 1970. 342 p.

Descriptors: *Administrative agencies, *Public lands, *Resource development, *Federal reservations, Water resources, Water resources development, Conservation, Fish conservation, Wildlife, Wildlife conservation, Water policy, Area redevelopment, Federal government, Natural resources, Multiple-purpose projects, Water supply, Lumber, Recreation, Land use, Forests, Land development, Land resources, Non-structural alternatives.
Identifiers: *Public Land Law Review Commission.

The Natural Resources Council of America has undertaken to review and analyze the work of the Public Land Law Review Commission. The Commission was directed to determine the best uses of some 700 million acres of public lands and to make recommendations concerning the laws governing these public lands. The review is conducted in three parts. Part one, entitled 'Reviews of One-Third of the Nation's Land', includes: (1) a review of the commission's final report; (2) environment and water resources; (3) fish and wildlife relations; (4) the Outer Continental Shelf; (5) administrative and legislative jurisdiction; and (6) disposal and retention of public lands. Part two, entitled 'Independent Reviews of Reports' includes: (1) regional and local land use planning; (2) public land timber policy; (3) water resources; (4) fish and wildlife resources; (5) outdoor recreation uses; and (6) revenue sharing in lieu of taxes. Part three includes reports on the eleven meetings held by the Commission, the Advisory Council, and Governors' representatives. The reports are not verbatim, but are accounts attempting to capture the sense of discussion and provide a useful background for understanding consideration of problems and recommended solutions. (See also W71-07228 thru W71-07236) (Hart-Florida)
W71-07227

COMMENTS ON THE MAKEUP AND DIRECTION OF THE PUBLIC LAND LAW REVIEW COMMISSION'S FINAL REPORT AND RECOMMENDATIONS,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 4-12 1970. 37 ref.

Descriptors: *Public lands, *Federal reservations, *Administrative agencies, *Resource development, Conservation, Land use, Land development, Land resources, Non-structural alternatives, Economics, Land management, Land, Federal government, State governments, Local governments, Planning, Future planning (Projected), Project planning, Legislation.

The Public Land Law Review Commission's report is organized to accommodate the finding of the study program; accordingly, in the author's opinion it is rather disjointed. Chapters One and Two describe 'where and what are public lands' and to whom they are important. Plenary recommendations on coordinating public land use with environmental problems are covered in Chapters Three and Four. Major individual commodities and services in the use of public lands are contained in Chapters 5-13. Chapters 14-19 deal with such special problems as 'land grants to the states' and 'federal legislative jurisdiction'. Recommendations on organization, administration, and budgeting are in Chapter 20. Despite disavowals, economic considerations appear to dominate the rationale for many recommendations. It is suggested that Congress should become more involved in establishing guidelines for land use and disposal. Also, the report urges state and local governments to become more involved with disposition of public lands within their borders. Additionally, the report advocates greater public participation in public land-use planning and in developing an understanding of the nature and extent of permitted uses. (See also W71-07227) (Hart-Florida)
W71-07228

THE ENVIRONMENT AND WATER RESOURCES,
Harold G. Wilm.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 47-57, 1970.

Descriptors: *Water resources, *Land resources, *Environment, *Federal reservations, Area redevelopment, Water resources development, Public lands, Administrative agencies, Non-structural alternatives, Land management, Federal government, State governments, Planning, Future planning (Projected), Project planning, Legislation, Lumber, Forests, Land development.

Under the dominant land use concept, if a tract of public land is classified for timber production, the land manager may be tempted to manage entirely for wood production. However, the dominant use concept should be broadened to include the greatest net public benefit theory, maximizing all resource values. Comprehensive land-use planning should be effected, focusing on administrative policies and intergovernmental procedures to include cost-sharing guidelines and proposing alternative actions for contingencies. However, financial assistance furnished the states is inadequate to enable them to exert full responsibility for water and land resource planning. Also, although the statutory goals are laudatory, they are too general for use by land managers; the goals must be much more explicit and descriptive. It is suggested that government should sell water arising from and leaving public lands at prices equal to the net cost of watershed and forest management prices. Although the Public Land Law Review Commission recommended merger of the Forest Service and the Department of the Interior into a new Department of Natural Resources, the recommendation was opposed because of administrative complications. (See also W71-07227) (Hart-Florida)
W71-07229

FISH AND WILDLIFE AS RELATED TO OTHER RESOURCES AND VALUES,
Phillip W. Schneider.
In: What's Ahead for Public Lands, Natural Resources Council of America, p 58-74, 1970.

Descriptors: *Fish, *Wildlife, *Water resources, *Land resources, Lumber, Lumbering, Environment, Federal Reservations, Area redevelopment, Water resources development, Public lands, Administrative agencies, Non-structural alternatives, Land management, Federal government, State governments, Planning, Future planning (Projected), Project planning, Legislation, Forests, Land development.

The author of this article finds two recommendations of the Public Land Law Review Commission to be highly objectionable: (1) replacement of the multiple-use doctrine with a dominant use concept; and (2) a strong emphasis on statutory direction of non-commodity values and their management. The primary objective of the public land custodian should be to manage federal public lands to prevent damaged environmental quality and enhance the quality of the environment where feasible. Domestic livestock grazing is the largest past and present use; timber production on federal land represents one-third of the nation's output; there are 8245 producing mineral leases on federal lands; and commercial and recreational occupancy are important uses. Public land policy, while assuring environmental quality, must also encourage economic growth. Furthermore, clear statutory authority should be given to federal officials for final land use decisions that affect fish and wildlife habitats or populations on public lands. A federal-state fish and resident wildlife coordinating committee should be established in each state. Upon disposal of federal public lands, rights should be retained to protect fish and wildlife. (See also W71-07227) (Hart-Florida)
W71-07230

THE OUTER CONTINENTAL SHELF,
Frank J. Barry.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 75-84, 1970. 10 p, 19 ref.

Descriptors: *Administrative agencies, *Submerged Lands Act, *Oil, *Regulation, Administrative agencies, Leases, Exploitation, Federal jurisdiction, Federal government, State jurisdiction, Oil fields, Legislation, Oil industry, Beds, Beds under water, Continental Shelf.
Identifiers: *Outer Continental Shelf Lands Act.

The resources, Legislation, Regulations, and Commission's recommendations concerning the Outer Continental Shelf are considered in this article. The Continental Shelf is defined, and exploitation of mineral resources, both present and future, discussed. Two acts, the Submerged Lands Act and the Outer Continental Shelf Lands Act, directly affect exploitation of the shelf, and they are briefly considered. Regulations promulgated by the Secretary of the Interior under the Acts are commented upon. Although the federal legislation was intended to pre-empt state intervention in the Outer Continental Shelf, several states attempt to regulate oil production. Deficiencies listed in administration of the Outer Continental Shelf are: (1) failure of federal authorities to exercise exclusive jurisdiction and to permit production at the maximum efficient rate; (2) failure to prescribe and enforce strict regulations for environmental protection; (3) failure to conduct pre-leasing investigations to obtain maximum remuneration; and (4) failure to permit leasing by small independent operators. Also, the many recommendations of the Public Land Law Review Commission are discussed and criticized in detail. (See also W71-07227) (Hart-Florida)
W71-07231

POLICY, PLANNING, AND ADMINISTRATION,
Lynton K. Caldwell.

In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 116-1281970. 13 p, 4 ref.

Descriptors: *Planning, *Administration, *Administrative agencies, *Federal project policy, Projects, Project planning, Project purposes, Future planning (Projected), Decision making, Programs, Non-structural alternatives, Adoption of practices, Coordination.

Those portions of the report of the Public Land Law Review Commission concerned with overall policy, planning, and administration are examined in this review. It is not concerned with specific resource use nor with primarily technical aspects of law or fiscal policy. The author first examines the context of the report and its general character and orientation, then considers three groups of recommendations pertaining to policy, planning, and administration, and concludes with observations on how the commission's report may best be used. Major topics are entitled: (1) characterizing the report; (12) underlying premises and assumptions; (3) some specific recommendations, which include land use planning, land policy and the environment, and administrative organization; and (4) implementing the recommendations. (See also W71-07227) (Hart-Florida)
W71-07232

THE DEVELOPMENT, MANAGEMENT, AND USE OF WATER RESOURCES ON THE PUBLIC LANDS,
Edward Weinberg.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 181-189, 1970.

Descriptors: *Water resources development, *Water management (Applied), *Public land, *Water utilization, Reservation doctrine, Administrative agencies, Legal aspects, Judicial decisions, Water allocation (Policy), Eminent domain, Condemnation, Preferences (Water rights), Federal government, Non-structural alternatives, Water policy, Water requirements, State governments.

In this review of the Public Land Law Review Commission's 'Study of the Development, Management, and Use of Water Resources on the Public Lands' two legal issues are considered: (1) does the present legal system provide for federal rights adequate for present and future uses on the public lands; and (2) do federal water rights under the present legal system interfere with or obstruct beneficial use of available water for beneficial non-federal public and private purposes. The author believes the study unduly magnifies uncertainties posed by the reservation doctrine and its potential for obstructing beneficial use, citing three reasons for his view: (1) the quantity of water required by federal agencies is negligible in comparison with the total western state requirements; (2) only one instance is shown where the reservation doctrine permitted taking a water right vested under state law without compensation; and (3) conclusions are based upon inferences rather than judicial decisions. Implications of the reservation doctrine upon conservation interests are also considered. The author believes that the fundamental question presented is whether the reservation doctrine is meritorious and serves a useful purpose. (See also W71-07227) (Hart-Florida)
W71-07233

REVIEW OF THE REPORT ON FISH AND WILDLIFE RESOURCES ON PUBLIC LANDS,
Lloyd W. Swift.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 190-201, 1970.

Descriptors: *Administrative agencies, *Public lands, *Fish, *Wildlife, Permits, Federal government, State governments, Federal reservations, National parks, Recreation, Fish management, Fish conservation, Wildlife conservation, Highway effects, Hunting, Wildlife management, Animal control, Balance of nature, Wildlife habitats, Habitat improvement, Legislation, Financing, Government finance.

In reviewing the report by the Public Land Law Review Commission on fish and wildlife resources on public lands, this article considers: (1) objectives of the study; (2) methods used; (3) accuracy; (4) inclusiveness; (5) accuracy of analysis; (6) problem and policy issue identification; and (7) alternatives. Some propositions discussed in the section dealing with alternatives are: (1) harvest fish and game on federal lands; (2) federal-state cooperation in fish and wildlife management; (3) responsibility for habitat management on federal lands; (4) return of ceded fish and wildlife jurisdiction to the states; (5) use of water for fish and wildlife management on federal lands; (6) highway planning in relation to fish and wildlife management; (7) recreational use of wildlife refuges; (8) public hunting to control game animals in national parks; (9) simplifying statutes pertaining to fish hatcheries and wildlife refuges; (10) single jurisdiction over federal land areas; (11) retention of important fish and wildlife values in disposal of public lands; (12) increasing the disposals of land for fish and wildlife management through the Recreation and Public Purposes Act; (13) increasing federal funds for fish and wildlife programs on federal lands; and (14) requirements for state hunting and fishing licenses on federal lands. (See also W71-07227) (Hart-Florida)
W71-07234

A REPORT ON THE PUBLIC LAND LAW REVIEW COMMISSION MEETING, FEBRUARY 21, 1969, WASHINGTON, DC,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 244-251, 1970.

Descriptors: *Continental shelf, *Administrative agencies, *Beds under water, *Public lands, Judicial decisions, Legal aspects, Administration, Administrative decisions, Beds, Oil, Oil industry, Oil fields, Regulations, Federal project policy, State governments, Federal jurisdiction, Leases, Boundary disputes, Environment, Conservation, Natural resources, Legislation, Project planning, Water policy.

The topics discussed at this meeting of the Public Land Law Review Commission were Outer Continental Shelf lands and administrative procedures on public lands. The report on the Outer Continental Shelf attempts to capture the sense of the various viewpoints regarding major policy issues or possible alternatives to the existing systems of law, regulation, and policies. Six questions were considered at the meeting on the Continental Shelf; the positions represented on the questions were: (1) oil, gas, and mining interests wished to continue the present regulation system of exploitation, with no requirement to divulge 'trade secrets' and without leasing of hard minerals; (2) states adjacent to the Shelf desired a firm boundary and larger role in development of policy, regulations, and practices, and a share of revenues; and (3) more general interests desired increased emphasis upon the Shelf's environment and coordinated resource management. The section on administrative procedures was primarily concerned with administrative law relating to public lands. (See also W71-07227) (Hart-Florida)
W71-07235

A REPORT ON THE PUBLIC LAND LAW REVIEW COMMISSION MEETING, APRIL 17-18, 1969, WASHINGTON, DC,
Hamilton K. Pyles.
In: What's Ahead For Our Public Lands, Natural Resources Council of America, p 252-259, 1970.

Descriptors: *Public lands, *Fish, *Wildlife, *Water resources, Administrative agencies, Administrative decisions, Administration, Reservation doctrine, Conservation, Fish conservation, Federal reservations, Land tenure, Fish management, Wildlife conservation, Wildlife habitats, Wildlife management, Recreation, Hunting, Fishing, Natural resources, Legal aspects.

This article reviews the Public Land Law Review Commission meeting considering: (1) fish and wildlife resources on the public lands and (2) the development, management, and use of water resources on the public lands. Five questions concerning each of these two topics were discussed at the meeting. For example, two questions on fish and wildlife resources were: (1) should the fact that public lands are valuable for fish and wildlife support and use constitute the determinant, standing alone, as to whether such public lands should be disposed of or retained in federal ownership; and (2) what should be the role of federal lands and resources in supporting, protecting, and enhancing various fish and resident species, and in providing for their use and enjoyment by individuals. The responses given to the questions are analyzed and commented upon. The questions presented in the water resources section are similarly considered and discussed. An example of the water resources questions is: does the present legal system provide for federal water rights adequate for present and future uses on the public lands. (See also W71-07227) (Hart-Florida)
W71-07236

WATERS V PUTNAM (REVIEW OF ADMINISTRATIVE DECISION AS TO REPRESENTATION ON WATERSHED DISTRICT BOARD).
183 NW 2d 545-551 (Minn 1971).

Descriptors: *Minnesota, *Watershed management, *Water districts, *Administrative decisions, Administrative agencies, Adjudication procedure, Water allocation (Policy), Decision making, Legislation, Flood control, Surface runoff, Water zoning, Water resources development, Local governments, State governments, Cities, Surface waters, Water conservation, Water management (Applied), Judicial decisions, Legal aspects.

Plaintiff landowners sought writs of certiorari and mandamus in obtaining review of defendant Water Resources Board's refusal to reopen proceedings establishing a watershed district. Plaintiff contended that appeal by certiorari was necessary, as there was no regular appeal procedure from the Water Resources Board's decision, and that the Board should be forced to reapportion the board of managers of a multi-county watershed district according to the water conservation needs of the area. Defendant contended that plaintiffs had normal appellate procedures open to them and that the Water Resources Board, in exercising its discretion, had no obligation to insure equal representation on the board of managers. In affirming the quashing of the writs by the lower court, the Supreme Court of Minnesota noted that plaintiffs had normal appellate procedures for judicial review which it failed to utilize in timely fashion. In exercising its discretion, the Water Resources Board had no constitutional obligation to insure equal county representation on the board. (Smiljanich-Florida)
W71-07237

BROOKS V VOLPE (CONSTRUCTION OF HIGHWAY NEAR RECREATION AREA).
319 F Supp 90-92 (WD Wash 1970).

Descriptors: *Highways, *Highway effects, *Recreation facilities, *Camp sites, Federal government, Environmental effects, Parks, Recreation, Wildlife, Wildlife conservation, Waterfowl, Legislation, Streams, Ecology, Environment, Legal aspects, Judicial decisions.
Identifiers: *National Environmental Policy Act, *Federal-Aid Highway Act.

Plaintiffs sought a preliminary injunction to enjoin defendants, representing the Department of Transportation, from constructing part of an interstate highway on the northern border of a campground

and recreational area. Plaintiffs alleged non-compliance with portions of the Federal-Aid Highway Act of 1968 and the National Environmental Policy Act of 1969. Plaintiffs contended that the former act restricted and conditioned the use of public parks, recreational areas and wildlife-waterfowl refuges and that the latter act required a detailed project statement by the defendants, which they had failed to prepare. The federal district court denied the injunction. The proposed highway north of the campground areas was not a use contemplated by the Federal-Aid Highway Act. The National Environmental Policy Act was prospective and not retrospective legislation, and the administrative decision concerning location of the highway was made prior to passage of the act. Therefore a detailed statement was not required. (Duss-Florida)
W71-07304

WATERSHED LOANS.
Purdue Univ., Lafayette, Ind. Water Resources Research Center.

Available from the National Technical Information Service as PB-198 647, $3.00 in paper copy, $0.95 in microfiche. 7 Code of Federal Regulations, Secs 1823.141 thru 1823.161 (1970). 15 p.

Descriptors: *Administrative agencies, *Watershed Protect. and Flood Prev. Act, *Watersheds (Basins), *Loans, Regulations, Legislation, Watershed management, Local governments, Financing, Interest, Capital, Water supply, Water rights, Dams, Drainage, Irrigation, Legal aspects.

Setting forth general policies and authorizations, these administrative regulations provide for watershed loans and advances, under the Watershed Protection and Flood Prevention Act, to local organizations. Technical and financial assistance may be given to such organizations for planning and carrying out works of improvement and for protecting and developing the land and water resources in small watershed or subwatershed project areas, including recreation, wildlife, and storage of water for future use. The local populace acting through local organizations must initiate and assume full responsibility for small watershed projects. Applications are made through the county Farmers Home Administration (FHA) office. Other topics covered by the section include: (1) eligibility for loans and advancements; (2) purposes and limitations for loans and advancements; (3) special requirements for loans and advances; (4) terms and interest rates; (5) security; (6) approval; (7) multiple-loan disbursements; (8) closing of loans and advances; (9) accountability for loan proceeds; (10) accounts and records; (11) loan approval; (12) loan closing; (13) processing advances; and (14) actions subsequent to closing. (Hart-Florida)
W71-07305

PUBLIC HEARINGS UNDER THE FEDERAL WATER POLLUTION CONTROL ACT.
18 Code of Federal Regulations, Part 606 (1970). 3 p.

Descriptors: *Administrative agencies, *Adjudication procedure, *Water pollution control, *Regulation, Water quality, Water quality control, Water pollution, Pollution abatement, Administrative decisions, Legislation, Administration, Federal government.
Identifiers: *Water Pollution Control Act.

The procedures for public hearings under the Federal Water Pollution Control Act are established in this regulation. The following areas are covered: (1) definitions, (2) initiation of proceeding and appointment of the hearing board, (3) organization and general procedures of the board, (4) notice of hearing, (5) service of notice of hearing, (6) publication of notice, (7) parties, (8) presentation of evidence by the commissioner, (9) hearing procedure, (10) record of proceedings, (11) oral argument, and (12) final findings and recommendations. The hearing board is composed of five persons appointed by the Secretary of the Interior. The hearing is generally informal; however, the board may rule upon admissibility of evidence, examine witnesses, and regulate the course of the hearing. A verbatim record of the hearing is required. Witnesses are sworn, and each party may present evidence and cross-examine witnesses. Oral arguments are permitted in the discretion of the board. (Hart-Florida)
W71-07308

ENVIRONMENTAL POLICY: NEW DIRECTIONS IN FEDERAL ACTION, RESTRUCTURING FOR COORDINATIVE POLICY AND ACTION,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 04A.
W71-07310

ENVIRONMENTAL MANAGEMENT: WATER AND RELATED LAND,
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07311

ENVIRONMENTAL POLICY AND THE CONGRESS,
Senate, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07312

FEDERAL POLICY PLANNING FOR THE MARINE ENVIRONMENT,
National Council on Marine Resources and Engineering Development, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07313

ENVIRONMENTAL MANAGEMENT AND THE DEPARTMENT OF THE INTERIOR,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 04A.
W71-07314

PROVIDING ENVIRONMENTAL SCIENCE SERVICES,
Department of Commerce, Washington, D.C.
Walter A. Hahn.
Public Administration Review, Vol 28, No 4, p 326-341, July-Aug 1968.

Descriptors: *Environment, Federal government, Management, Planning, Coordination.
Identifiers: *Environmental Science Services Administration, Department of Commerce, Environmental policy analysis.

It is the purpose of this article to describe the origins and subsequent developments of the Environmental Science Services Administration (ESSA) as an experiment in public administration. It briefly traces what has come of the 'ESSA idea' from its conceptual origins to its current manifestation. Some of the services performed by ESSA are: Hazard warning, aid to business and government, consumer benefits, aid to other federal agencies, and assistance in maintaining environmental quality. The ESSA, formed in 1965, combines the environmental science and service capabilities and activities of the Weather Bureau, the Coast and Geodetic Survey, and the Central Radio Propagation Laboratory. Today there exists under one organizational roof the Department of Commerce's activities in seismology, oceanography, hydrology, meteorology, geophysics, hydrography, aeronomy, geodesy, geomagnetism and telecommunications. The ESSA idea also encompasses a concept labelled 'the multiple use of technology'--using modern technology to solve environmental problems. Another concept of equal importance is a broad program of both long-range, mission-oriented research and development. The essence of ESSA's entire output is information: Warnings, forecasts, charts and reports, consulting and research, science and technology. ESSA has provided leadership in a number of international environmental activities. In order to work effectively in the future, environmental policy analysis is urgently needed. (Wray-Chicago)
W71-07315

THE SAN FRANCISCO BAY PLAN: COMBINING POLICY WITH POLICE POWER,
E. Jack Schoop, and John E. Hirten.
Journal of the American Institute of Planners, p 2-10, Jan 1971.

Descriptors: *Water policy, Decision making, Management, Methodology, Dredging.
Identifiers: *San Francisco Bay Plan, *San Francisco Planning and Urban Renewal Association, *Police power, Fill control power, Comprehensive plan.

In 1969, the San Francisco Bay plan received an AIP Award of Merit in recognition of its methodology and relevancy. It also won sufficient political support to secure the establishment of a permanent commission to carry out the plan. Extensive participation of the public and decision makers was employed to develop needed support. Capitalizing on its interim power to control filling and dredging while the plan was being prepared, the San Francisco Bay Conservation and Development Commission openly developed its plan as a series of policy decisions establishing a legal and technical frame of reference for use of the fill control power. Policy issues in the plan are clear-cut and relevant, and a tight management system was used to orchestrate the participation of many consultants and a large number of decision makers and interest groups. The process is being continued in modified form as the commission begins implementation of the plan. (Wray-Chicago)
W71-07316

A NEW KIND OF INSTITUTION,
New England River Basins Commission, Boston, Mass.
Frank Gregg.
Water Spectrum, Army Corps of Engineers, Spring 1971, p 26-32.

Descriptors: *Water Resources Planning Act, Coordination, Management, *Regional analysis.
Identifiers: *New England River Basin, Southeastern New England, State focus, Federal-State cooperation, Joint planning.

The New England River Basins Commission has considered since its founding in 1967 how it can best contribute to sound management of the region's water and related land resources. A major output of the commission is expected to be reports which recommend Federal, State, local and private actions to meet public needs for conservation and use of waters and related lands. The Commission's strategy for completing the comprehensive joint plan includes: (a) a New England Framework to provide information, (b) water and land management plans for each state, (c) water and land management plans for selected sub-regions. A principle weakness of coordinated planning to date is that the planning process is not seen by all participants (Federal and State) as a vehicle that each can use for planning its own action programs. The Commission aims to develop a planning approach by which Federal and State agencies develop positive plans for major uses--from preservation of ecological systems to intensive development projects. To achieve joint planning, the Commission will assemble a professional staff team for each formally organized study. They will formulate broad policy guidelines. Federal agencies, working with their State counterparts, will be responsible for planning for specific uses and functions: flood control, water supply and quality control, outdoor

recreation, fish and wildlife, etc. Appropriations for participation by Federal agencies and Commission staff in joint studies will be requested through coordinated budgets submitted to the Water Resources Council. Cost of organized State participation in joint plans will be born primarily by the States, assisted by Federal planning grants. (Wray-Chicago)
W71-07320

MALTA CONFERENCE - PACEM IN MARIBUS.

Lawyer of the Americas, Vol 2, No 3, p 481-497, Oct 1970.

Descriptors: *Conferences, *Oceans, *Resources, *Ecology, *Water pollution, *Legal aspects, Oil wastes, Exploration, Fisheries, Law of the Sea.
Identifiers: *Malta Conference 1970, Atlantic - Pacific Canal.

Some sixty countries participated in the 1970 Malta Conference which was sponsored by the Center for the study of Democratic Institutions in Santa Barbara, California. Their intent was to generate support for the establishment of a continuing body in Malta to guide the United Nations and others regarding decisions about the ocean. Political and legal problems, the extraction of living and non-living resources, and science policy and ecology were discussed. Fisheries problems, non-living resource exploitation policy and jurisdiction, U.S. - U.S.S.R. Draft Treaty on Prohibiting the Emplacement of Nuclear Weapons on the Seabed and Ocean Floor, limits of National Jurisdiction, and President Nixon's proposal for a seabed regime were included. The need for conservation, rational use of ocean resources and pollution were considered in conjunction with the above subjects. (Ensign-PAI)
W71-07330

CALIFORNIA ENVIRONMENTAL LAW - A GUIDE.
Center for California Public Affairs, Claremont.

Center for California Public Affairs, Claremont, Cal, 1971. 171 p, 79 ref.

Descriptors: *California, *Legislation, *Environment, *Air pollution, *Water quality, *Land use, *Solid wastes, *Pesticides, *Radiation, Laws, Statutes.

The major state laws regulating environmental quality in California including amendments and new laws enacted by the 1970 legislature are summarized. The scope, major provisions and arrangement of selected statutes are outlined. The core of California law concerning air quality, land use, solid waste management, noise control, pesticides and radiation are described. Selected bills which were not passed are summarized as there is a good possibility that they will be re-introduced in the 1971 legislature. (Ensign-PAI)
W71-07331

STANDARDS-SETTING CONFERENCES, HEARINGS, AND NOTIFICATION OF ALLEGED VIOLATORS OF WATER QUALITY STANDARDS.
18 Code of Federal Regulations, part 604 (1970). 5 p.

Descriptors: *Administrative agencies, *Adjudication procedure, *Water quality, *Regulation, Water quality control, Water pollution, Water pollution sources, Water pollution control, Pollution abatement, Administration, Legislation, Federal government.

Procedures for revision of water quality standards and for public hearings on water quality are established in this regulation. Definitions of various terms, such as 'Act', 'commissioner', and 'water quality standards', are first provided. Then, provisions are set forth for: (1) INITIATION OF WATER CONFERENCES, (2) organization and general procedures of conferences, (3) notice of conferences, (3) notice of conferences, (4) service of notice, (5) publication of notice, (6) parties, (7) presentation of material by the Federal Water Pollution Control Administration, (8) conference procedure, (9) record of proceedings, and (10) promulgation of water quality standards. Provisions concerning water quality public hearings relate to: (1) initiation of proceedings and appointment of the hearing board, (2) organization and general provisions of the hearing board, (3) notice of hearing, (4) service of notice, (5) publication of notice, (6) parties, (7) presentation of material by the commissioner, (8) records of procedure, (9) oral arguments, and (10) final findings and recommendations. In addition, provisions are promulgated for notification of alleged violators of water quality standards by the Secretary. (Hart-Florida)
W71-07354

SECOND SESSION OF THE CONFERENCE ON THE MATTER OF POLLUTION OF LAKE MICHIGAN AND ITS TRIBUTARY BASIN.
Federal Water Pollution Control Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07361

FILING OF REPORTS WITH SECRETARY OF THE INTERIOR BY PERSONS WHOSE ALLEGED ACTIVITIES RESULT IN DISCHARGES CAUSING OR CONTRIBUTING TO WATER POLLUTION,

18 Code of Federal Regulations, part 607 (1970). 3 p.

Descriptors: *Administrative agencies, *Water pollution control, *Regulation, *Water pollution sources, Water pollution, Legislation, Federal government, Water quality, Water quality control, Pollution abatement, Pollutants, Thermal pollution, Pollutant identification, Water pollution treatment, Administration.

At the request of a majority of conferees at any conference, or in connection with a hearing under the Federal Water Pollution Control Act, the Secretary of the Interior may require any person whose alleged activities result in discharges causing or contributing to water pollution of waters which are the subject of the conference or hearing to report the character, kind, and quantity of discharges, and methods used to prevent pollution. The request for the written report may be served by mailing. No particular form for the report is required unless specified by the Secretary. The report, based on existing data, must identify the causes, sources, and physical, chemical, and biological properties of the pollutional discharge. Also, the thermal characteristics and the 24 hour daily quantity of the discharge must be reported. Facilities used to prevent or reduce the discharges are to be described. The report shall be filed in five copies within the time specified by the Secretary. Trade secrets are not required to be disclosed, and all data shall be considered confidential. The penalty for failure to comply is forfeiture of $100 for each day of default. (Hart-Florida)
W71-07421

HALLS LEVEE DISTRICT V HAUBER (ILLEGAL CONSTRUCTION OF DAM ACROSS LEVEE DISTRICT'S DITCH).
461 SW2d 16-24 (Ct App Mo 1970).

Descriptors: *Missouri, *Drainage districts, *Dams, *Ditches, Flood control, Easements, Right-of-way, Drainage, Levees, Lakes, Remedies, Land reclamation, Public rights, Relative rights, Water levels, Benefits, Outlets, Judicial decisions, Legal aspects, Missouri River.

Defendants appealed from a judgment granting plaintiff, a county levee district, a mandatory injunction requiring defendants to remove a rock dam. Defendants had erected the dam across a drainage ditch maintained by the plaintiff. Defendants had originally removed a dam built by the district and subsequently sought permission from it to rebuild the dam. Permission was denied, but defendants nevertheless built the dam. Defendants contended the trial court erred because: (1) plaintiff had an adequate remedy at law by filing another reclamation plan, (2) removal of the dam would be contrary to plaintiff's present reclamation plan, (3) plaintiff had no drainage rights over defendants' land, and (4) plaintiff's suit enforced private rights and not district rights. The Kansas City Court of Appeals both affirmed and amended the lower court decision for plaintiff. Plaintiff's equity action was proper as its legal remedy would have constituted an unnecessary delay in securing relief. Moreover, removal of the illegal dam would not be contrary to the district's reclamation plan, and the question of the plaintiff's rights of drainage across defendants' land was irrelevant to the case. Finally, plaintiff was legally entitled to maintain the suit notwithstanding the fact that success might result in benefits to the private rights of resident landowners. (Duss-Florida)
W71-07429

DRINKWINE V STATE (REASONABLE USE DOCTRINE AS APPLIED TO PERCOLATING WATERS).
274 A2d 485-487 (Vt 1970). 3 p.

Descriptors: *Vermont, *Percolating water, *Reasonable use, *Relative rights, Competing uses, Water supply, Water shortage, Groundwater, Water conservation, Groundwater mining, Water demand, Water requirements, Land tenure, Water rights, Springs, Subsurface waters, Water wells, Pumps, Withdrawal, Water table, Water rights, Administrative agencies, Judicial decisions, Legal aspects.

Plaintiff landowners sought to enjoin defendant State Fish and Game Department from continuing to operate certain pumps and wells which allegedly pumped unreasonable amounts of water to the detriment of plaintiff's springs. Plaintiff contended that the doctrine of reasonable use should apply to percolating waters due to the present increased scarcity and value of water as a commodity. Defendant contended that the doctrine of reasonable use did not apply to percolating waters and that plaintiff had failed to adequately allege the scarcity of water and the causal connection between defendant's pumping and the depletion of plaintiff's springs. In affirming a lower court order dismissing plaintiff's complaint, the Supreme Court of Vermont noted that the doctrine of reasonable use had no application to the case. Percolating waters are regarded as a part of the land and, as such, no correlative rights in the waters exist between adjacent landowners. The allegations of fact were insufficient to show a scarcity of waters in Vermont or a causal connection between defendant's actions and plaintiff's injury. (Smiljanich-Florida)
W71-07430

GRANT V KATSON (INJUNCTION TO PREVENT UPHILL LANDOWNER FROM FURTHER DIVERSION AND INCREASE IN SURFACE WATER RUNOFF).
274 A2d 88-90 (Md App 1971). 3 p.

Descriptors: *Maryland, *Surface runoff, *Diversion, *Remedies, Drainage effects, Alteration of flow, Land tenure, Competing uses, Damages, Erosion, Baffles, Concrete structures, Diffusion, Runoff, Repulsion (Legal aspects), Riddance (Legal aspects), Artificial use, Judicial decisions, Legal aspects.

Plaintiff landowner brought action for continuing trespass and an injunction. Defendant, an uphill landowner on a natural watershed, increased and

diverted the flow of surface water over his land onto the plaintiff's downhill land by constructing a stone patio with improper drainage and a water baffle. Plaintiff contended that an injunction was the proper remedy. Defendant contended that an award of money to the plaintiff for construction of a new drainage system on his property would be sufficient to prevent future damage by diverting the objectionable surface flow. In partially reversing a lower court judgment, the Court of Appeals of Maryland held that, although a judgment for damages was correct, an award of money to build a new drainage system was erroneous. A downhill landowner is entitled to an injunction requiring uphill landowners to prevent the further artificial increase and diversion of surface waters onto the downhill land. The award to build a new drainage system was unnecessary, as defendant should bear the burden of correcting the situation. (Smiljanich-Florida)
W71-07431

GONSOULIN V SHELL OIL CO (ESTOPPEL BY CONTRACT AS APPLICABLE TO MINERAL LEASES).
321 Fed Supp 900-902 (WD La 1971).

Descriptors: *Louisiana, *Leases, *Contracts, *Royalties, Bayous, Beds under water, Water rights, Land tenure, Water allocation (Policy), Water distribution (Applied), Water contracts, Acreage, Land resources, Ownership of beds, Sands, Exploitation, Payment, Mineralogy, Oil, Oil industry, Gases, Gulf Coastal Plain, State governments, State jurisdiction, Judicial decisions, Legal aspects.

Plaintiff landowner brought action to cancel a lease under which defendant oil company was granted mineral rights in land. Plaintiff contended that defendant wrongfully allocated water bottom acreage to the state and that plaintiff should therefore recover royalties paid to the state. Defendant contended that plaintiff had acceded to the original division order allocating royalties to the state without disputing the apportionment of acreage and was therefore estopped to assert that royalties from the water bottoms were wrongfully paid to the state. In granting defendant's motion for summary judgment, the United States District Court for the Western District of Louisiana noted that on two occasions plaintiff had signed agreements allocating the water bottom acreage to the state. Defendant relied on these agreements and paid royalties according to their strict terms. The principle of estoppel by contract is applicable to disputes over oil and gas leases and to inaccurate apportionment in division orders. Plaintiff's proper remedy was an action against the state for unjust enrichment. (Smiljanich-Florida)
W71-07432

PUBLIC WORKS FOR WATER, POLLUTION CONTROL, AND POWER DEVELOPMENT AND ATOMIC ENERGY COMMISSION APPROPRIATION ACT, 1971.
Public Laws No 91-439, 84 Stat 890, 11 US Code Cong and Admin News, p 4100-4112 (1970). 13 p.

Descriptors: *Government finance, *Water resources development, *Administrative agencies, *Financing, Federal government, Legeslation, Administration, Grants, Projects, Pollution abatement, Water works, Water quality control, Rivers, Harbors, Flood control, Beach erosion, Interstate commissions, Waste treatment, Water conservation, Planning, Hydroelectric plants, Hydroelectric power, River basin commissions, Legal aspects.

Pursuant to previous acts of Congress, money is herein appropriated for specific public works relating to various agencies of government, including public works for water, pollution control, and water quality administration. The Army Corps of Engineers is authorized to conduct specific civil functions pertaining to rivers and harbors, flood control, beach erosion, and related purposes. The Department of the Interior is appropriated funds necessary to carry out the Federal Water Pollution Control Act for grants to interstate agencies and for construction of waste treatment works. The Department is further appropriated funds necessary for studies of water conservation and development plans and for activities preliminary to the reconstruction or extension of existing projects. Specific projects relating to water resources are provided funds necessary for their continuation. Regional power administrations, independent river basin commissions, and the Water Resources Council also receive designated funds. The various agencies involved are restricted as to the use of appropriations. (Smiljanich-Florida)
W71-07434

EMERGENCY COMMUNITY FACILITIES ACT OF 1970.
Public Law No 91-431, 84 Stat 886, 11 US Code Cong and Admin News p 4095 (1970).

Descriptors: *Local government, *Community development, *Treatment facilities, *Grants, Legislation, Federal government, Urban renewal, City planning, Economics, Public utilities, Pollution abatement, Public health, Public benefits, Water resources, Financing, Economic impact, Unemployment, Employment opportunities, Cities, Social aspects, Legal aspects.

The Housing and Urban Development Act of 1965, Title VII, is herein amended to authorize appropriation of one billion dollars for grants under a specific section of that act. The act is also amended to extend dates in other sections. The changes are made pursuant to a finding by Congress that, because of a shortage of funds, a large number of local governments throughout the nation are unable to finance construction of vital and urgently needed public facilities. There is an immediate need for such facilities in order to provide basic safeguards for the well-being of the people of the United States, to check widespread pollution of irreplaceable water sources, and to provide a method of combatting rising unemployment. (Smiljanich-Florida)
W71-07435

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN--COMPACT.
Public Law No 91-407, 84 Stat 856, 11 US Code Cong and Admin News, p 4060-4065 (1970). 6 p.

Descriptors: *Interstate compacts, *Interstate rivers, *Interstate commissions, *River basin commissions, Water districts, State governments, Federal government, Maryland, West Virginia, Pennsylvania, Virginia, District of Columbia, River basins, Water resources development, Administrative agencies, Pollution abatement, River basin development, Water conservation, Project planning, Standards, Sewage treatment, Industrial wastes, Water quality, Classification, Legal aspects.
Identifiers: *Potomac River Basin.

Pursuant to a compact among the states of Maryland, West Virginia, Pennsylvania and Virginia, and the District of Columbia, Congress herein consents to the creation of the Potomac Valley Conservancy District and the Interstate Commission on the Potomac River Basin. The Commission shall have the power: (1) to collect, analyze and distribute data on pollution and other water problems of the Conservancy District and to sponsor research therein; (2) to cooperate with other agencies in formulating uniform rules and regulations concerning pollution abatement and water resources development; (3) to cooperate with public and non-public agencies in the formulation and coordination of plans and programs relating to pollution abatement and water resources development; (4) to make, revise, and recommend to the signatory parties reasonable minimum standards for the treatment of sewage and industrial wastes in the Conservancy District; and (5) to establish water quality standards satisfactory for various classifications of use. The signatory parties will formulate a classification of interstate waters for this last purpose. Provisions as to subsections of the committee and financing are set forth. Congress withheld consent from the provisions as to water quality standards and water classification. (Smiljanich-Florida)
W71-07440

WATER BANK ACT.

Public Law 91-559, 84 Stat 1468, 15 US Code Cong and Admin News, p 6666-6670 (1970). 5 p.

Descriptors: *Wetlands, *Wildlife habitats, *Flood control, *Water conservation, Watershed management, Contracts, Land tenure, Federal government, Legislation, Farms, Agricultural watersheds, Migratory birds, Waterfowl, Wildlife conservation, Adoption of practices, Land management, Land development, Erosion control, Surface runoff, Soil erosion, Wind erosion, Eminent domain, Legal aspects, Administrative agencies, Financing.
Identifiers: *Water Bank Act.

The Water Bank Act is hereby enacted in order to conserve surface waters, to preserve and improve habitats for migratory waterfowl and other wildlife resources, to reduce runoff, soil and wind erosion, to contribute to flood control, and to effect other purposes. The Secretary of Agriculture is authorized to enter into ten-year agreements with landowners and operators in certain wetland areas. The owner shall agree: (1) to place in the program eligible wetland areas he designates; (2) not to drain, burn, fill, or destroy the areas' wetland character, nor to use such areas for agricultural purposes; (3) to effectuate the wetland conservation and development plan for his land; (4) to forfeit all rights upon transfer of the land and to refund all payments upon violation of the agreement; (5) not to adopt practices defeating the purposes of the agreement; and (6) to follow necessary additional provisions the Secretary may adopt. In return, the Secretary shall: (1) make a fair and reasonable annual payment in consideration of the landowner's obligations, and (2) bear a portion of the cost of the conservation and development plan. Various administrative details are set forth. (Smiljanich-Florida)
W71-07444

SUSQUEHANNA RIVER BASIN COMPACT.

Public Law No 91-575, 84 Stat 1509, 15 US Code Cong and Admin News, p 6710-6748 (1970). 36 p.

Descriptors: *River basin commissions, *Interstate compacts, *Federal government, *River basin development, Interstate rivers, Water resources development, United States, Maryland, New York, Pennsylvnia, Legislation, Administrative agencies, Federal-state water rights conflicts, Area redevelopment, Planning, Water management (Applied), Water quality control, Water supply, Flood protection, Watershed management, Recreation, Hydroclectric power, Consumptive use, Diversion, Legal aspects.
Identifiers: *Susquehanna River Basin Compact.

By this act of Congress, the United States is made a signatory party to the Susquehanna River Basin Compact, set forth herein, with certain reservations. Because of the interstate and national interest in the water resources of the river basin area, the United States, Maryland, New York, and Pennsylvania agree to create a commission to provide central administration, and comprehensive planning and management. The commission is composed of the governor of each signatory state, or his designee, and one Presidential appointee. The commission may plan, construct, and operate any project necessary to the purposes of the Compact, establish water standards, collect data, and sponsor research. The commission shall plan and implement water resources projects, administer the basin water resources, and compel compliance with

the provisions of the Compact or regulations of the commission by court action. Areas over which the commission may exercise power include: (1) water supply, (2) water quality management and control, (3) flood protection, (4) watershed management, (5) recreation, (6) hydroelectric power, and (7) regulation of withdrawal and diversions. Provisions are made for financing and auxiliary powers. Congressional reservations as to specific provisions are set forth. (Smiljanich-Florida)
W71-07453

RIVERS AND HARBORS, FLOOD CONTROL ACTS OF 1970.

Public Law, No 91-611, 84 Stat 1818, 16 US Code Cong and Admin News, p 7824-7845 (1970). 22 p.

Descriptors: *Rivers and Harbors Act, *Flood control, *Engineering structures, *Water resources development, Legislation, Federal government, Administrative agencies, Legal aspects, Social aspects, Economic impact, Public benefits, Navigation, Erosion control, River basin development, Navigable rivers, Harbors, Adoption of practices, Federal budgets, Political aspects, Water conservation, Natural resources, Construction costs.
Identifiers: *Flood Control Act.

The construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, beach erosion prevention, and other purposes is hereby authorized in the Rivers and Harbors, Flood Control Acts of 1970. The Secretary of the Army, acting through the Chief of Engineers, is authorized to prosecute the specified works in accordance with the plans recommended. The various projects and studies included, and the river basins involved, are set forth. The Secretary of the Army is to see that possible adverse economic, social and environmental effects relating to any proposed project have been fully considered and that the final decisions on the project are made in the best overall public interest. The Secretary must take into consideration the need for flood control, navigation, and the cost of eliminating or minimizing adverse effects such as water pollution, destruction of man-made and natural resources and esthetic values, and community or regional disruption. The objectives to be included in federally financed water resource projects are the enhancement of regional economic development, the quality of the total environment, the well-being of the people of the United States, and the national economic development. (Smiljanich-Florida)
W71-07462

A MODERN PROPOSAL FOR STATE REGULATION OF CONSUMPTIVE USES OF WATER,
Frank E. Maloney, and Richard C. Ausness.
Hastings Law Journal, Vol 22, No 3, p 523-560, 1971. 158 ref.

Descriptors: *Administration, *Consumptive use, *Water utilization, *Permits, Regulation, Water rights, Prior appropriation, Riparian rights, Legislation, Legal aspects, Water supply, Water users, Water demand, Water resources, Administrative agencies, Water policy, Reasonable use, Beneficial use, Preferences (Water rights), Domestic water, Industrial water, Agriculture, Municipal water.
Identifiers: *Model Water Code.

Discussing a chapter from the draft Model Water Code, this article sets forth a proposed permit system regulating consumptive uses of water. The discussion is divided into five parts: (1) regulation of consumptive uses of water, (2) regulation under Eastern permit systems, (3) the constitutionality of legislation regulating water rights, (4) significant features of consumptive use permit systems, and (5) permits under the Model Water Code. The article first discusses the two doctrines governing water use: (1) the Eastern riparian system, and (2) the Western appropriation system. The riparian system should be modified because of its uncertainty and its lack of administrative controls, while the appropriation system is too rigid. Eastern permit systems are discussed cursorily, with emphasis on the Model Water Use Act and the Iowa Permit System. The article concludes that a modern interpretation of state police power would preclude constitutional challenges in most states. Important features of the Model Water Code are its reasonable-beneficial use standard, which seeks to prevent wasteful consumption of water, and the security provided water rights. In this latter regard the Code adopts a system of limited-term permits. Finally, the article sets forth the permit provisions of the Code with explanatory comment. (Duss-Florida)
W71-07481

A BILL TO PROVIDE FOR THE CONTROL AND PREVENTION OF POLLUTION, DETERIORATION OF WATER QUALITY, AND DAMAGE TO LANDS AND WATERS RESULTING FROM EROSION TO THE ROADBEDS AND RIGHTS-OF-WAY OF EXISTING STATE, COUNTY, AND OTHER RURAL ROADS AND HIGHWAYS.

Senate Bill 279, 92d Cong, 1st Sess (1971). 5 p.

Descriptors: *Bank stabilization, *Roadbanks, *Erosion control, *Sediment control, Soil conservation, Legislation, Federal government, State governments, Roads, Road construction, Drainage systems, Road design, Environmental engineering, Erosion, Bank erosion, Soil erosion, Damages, Sedimentation, Environmental effects, Disposition (Sediments), Sediment distribution, Channel erosion, Multiple-purpose projects, Administration, Cost sharing, Project planning.

Federal assistance in abating river and stream erosion and preventing erosion damage to rural roadbeds is proposed in this bill. The purposes of this bill include: (1) preservation of land and water resources, (2) maintaining water supply quality, (3) protecting fish and wildlife habitat and recreational values, (4) beautifying natural landscapes, (5) enhancing road safety, and (6) strengthening the rural economy. To carry out these policies the Secretary of Agriculture would be authorized to furnish financial assistance to state, county, and local agencies for the planning and installation of measures needed to prevent roadbed erosion. To prevent and control stream and river erosion and the accompanying damage to water and land resources, the Secretary would be authorized to: (1) assist states, counties, and local agencies--including soil and water conservation districts and nonprofit agencies--in formulating measures to prevent erosion and sediment damage; and (2) to assist in the implementation of such plans with financial, technical, or other assistance. As a condition to such assistance the state or agency must: (1) bear not less than twenty-five per cent of the costs; (2) acquire necessary land, easements, or rights-of-way; and (3) arrange for operational and maintenance costs. (Earl-Florida)
W71-07482

MARINE POLLUTION CONTROL ACT OF 1971 (A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT).
Senate Bill 192, 92d Cong, 1st Sess (1971). 6 p.

Descriptors: *Water pollution control, *Pollution abatement, *Legislation, *Permits, Disposal, Sea water, Waste disposal, Environmental sanitation, Garbage dumps, Sanitary engineering, Legal aspects, Sewage disposal, Ultimate disposal, Waste dilution, Waste assimilative capacity, Water quality control, Federal government, Administrative agencies, Administrative decisions, Regulation, Great Lakes, Ecology, Oceans, Coasts, Industrial wastes.
Identifiers: Federal Water Pollution Control Act.

This proposed amendment to the Federal Water Pollution Control Act would require a permit for the disposal of refuse into the Great Lakes, coastal waters, or high seas. Such permits, applicable to refuse material originating within the United States, would be granted by the Administrator of the Environmental Protection Agency. Upon receipt of permit applications, the Administrator would investigate the: (1) refuse's characteristics; (2) physical, biological, and ecological impacts of disposal; and (3) the proposed manner of disposal. A comprehensive report would then be prepared for inclusion in the record of one or more mandatory public hearings. After the closing of public hearings the Administrator would be required to make public written findings of fact, conclusions, and a decision. No decision granting a permit could be made without clear and convincing evidence that the disposal activity would not endanger: (1) public health, (2) plant or animal life, (3) physical processes, (4) food chains, or (5) marine ecology or environment. No decision granting a permit could become final absent affirmative concurrence by the Council on Environmental Quality. Temporary permits would be available where technical difficulties prevented the disposal of refuse in compliance with this bill. (Earl-Florida)
W71-07483

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT.

Senate Bill 1012, 92d Cong, 1st Sess (1971). 12 p.

Descriptors: *Grants, *Water pollution control, *Legislation, *Financing, Federal government, Administration, State governments, Interstate, Interstate commissions, Interstate compacts, Pollution abatement, Administrative agencies, Capital supply, Waste treatment; Water purification, Water quality control, Water pollution treatment, Permits, Integrated control measures, Treatment facilities, Project planning, Cost repayment, Cost sharing, Costs, Administrative costs.
Identifiers: Federal Water Pollution Control Act.

A system of water pollution control grants and appropriations would be established under this proposed amendment to the Federal Water Pollution Control Act. Basic state water pollution control grants would be based upon: (1) population, (2) extent of pollution, and (3) financial need. Reasonable regulations would govern basic grants to interstate agencies. Administrative and personnel training costs could be included in basic grants. State or interstate agency plans would be eligible for approval if they: (1) provided for adequate administration; (2) contained reporting requirements; (3) set forth plans, policies, and methods; (4) contained extension or improvement provisions; (5) provided budgetary controls; and (6) contained acceptable priority criteria. Upon assurance that an improved water pollution control program was being developed, additional grants, not exceeding twenty-five per cent of the state or agency's federal share, as defined by the amendment, could be provided. The elements of an improved program include: (1) a mandatory waste permit system, (2) a sewage treatment program, (3) personnel training programs, (4) recruitment programs, and (5) an adequate planning program. Bonus grants, not exceeding forty per cent of the federal share, could be provided upon a showing that one or more improved elements have been developed. Otherwise unexpended funds would be available for 'exceptional' programs. (Earl-Florida)
W71-07484

A BILL TO AMEND THE FEDERAL WATER POLLUTION CONTROL ACT TO PROVIDE FINANCIAL ASSISTANCE FOR RIVER BASIN PROGRAMS.

Senate Bill 601, 92d Cong, 1st Sess (1971). 4 p.

Descriptors: *Water quality control, *Basins, *Grants, *Financing, Federal government, Watersheds (Basins), Groundwater basins, Integrated control measures, Legislation, Cost repayment, Government finance, Government supports, Administrative agencies, Interstate compacts, State

governments, Participating funds, Reimbursable costs, Specific costs, Water resources development, Treatment facilities, Waste treatment, Water pollution control, Administration, Administrative costs.
Identifiers: *Water Pollution Control Act.

A proposed amendment to the Federal Water Pollution Control Act, this bill would authorize grants to intrastate basin water quality management agencies. Up to fifty per cent of agency administrative, investigatory, operator training, and inspection costs would be financed through such grants. Grants would beconditioned upon a determination of: (1) consistency with applicable water quality standards, (2) appropriate state approval, and (3) state capability to execute plans. Interstate hydrological units would be eligible with state legislative approval. Basin plans must provide comprehensive water quality management, including: (1) waste-source control; (2) waste treatment facility construction, operation, and maintenance; (3) flow control, diversion, or impoundment; and (4) waste treatment financing and cost distribution techniques. Basins include rivers or portions of rivers, streams, tributaries, coastal waters, sounds, estuaries, ways, lakes and related land resources forming a hydrological unit. Water and land situated in a single metropolitan area are not eligible as basins. Grants are not to exceed three years, but may be renewed or extended. Agencies receiving such grants shall not be eligible for other Federal Water Pollution Control Act grants. (Earl-Florida)
W71-07485

POLLUTION AND THE LAW IN ILLINOIS,
Douglas W. Graham.
Chicago Bar Record, Vol 52, No 4, p 205-214, 1971. 32 ref.

Descriptors: *Illinois, *Water pollution control, *Pollution abatement, *Legislation, Water policy, Water pollution, Air pollution, Federal government, State governments, Local governments, Cities, Water districts, Environment, Federal jurisdiction, State jurisdiction, Administrative agencies, Institutions, Regulations, Industries, Standards, Interstate rivers, Legal aspects, Non-structural alternatives.

Increased concern for environmental quality has resulted in the creation of a diverse and complex body of laws, ordinances and regulations. A discussion of the laws and ordinances controlling pollution in Illinois and the jurisdiction and interactions of the federal, state, and local agencies enforcing them reveals the varied standards to which industry and citizens are subjected. Federal standards and enforcement procedures are examined. The Illinois Environmental Protection Act effected comprehensive change upon Illinois pollution law by creating centralized pollution control institutions. The various functions of these institutions are discussed, along with the enforcement of pollution laws. Powers of the state, counties, cities, and sanitary districts often overlap. Cities, although without exclusive responsibility for regulation and enforcement, can provide essential services in cases such as small or short-duration violations where it may be difficult or impossible to bring state investigative powers to bear quickly. Industries under concurrent pollution control of different agencies should comply with the most rigorous regulation to which they are subject. The Illinois Act and improved enforcement have enhanced the prospects for a better environment. (Smiljanich-Florida)
W71-07486

THE AREA OF ORIGIN AND A COLUMBIA RIVER DIVERSION,
Ralph W. Johnson.
Washington Law Review, Vol 46, No 2, p 245-281, 1971. 128 ref.

Descriptors: *Columbia River, *Columbia River Basin, *Inter-basin transfers, *Water transfer, Interstate rivers, Rivers, River basins, Basins, River basin development, River systems, Legal aspects, Diversion, Withdrawal, Planning, Water allocation (Policy), Water resources, Water resources development, Water utilization, Water supply, Water rights, Water sources.

A possible diversion of the Columbia River to the southwest is the subject of this article. The conflicts between area-of-origin protection and the needs of states out of the river basin are considered. The problem is discussed in light of problems which have arisen in California, Colorado, Nebraska, Texas, and Oklahoma. The following methods have been used to allocate interstate waters: (1) agreements between water users, (2) reciprocal legislation, (3) interstate compacts, (4) interstate litigation, and (5) congressional allocation. Congressional allocation is the most practical method, and congressional mandates in the area are superior to state regulations. A history of state and federal legislation is examined and evaluated in light of the possible diversion of the Columbia River. The author maintains that the Pacific Northwest should not continue total resistance to all studies dealing with diversion. If the water crisis continues in the Southwest, then Congress will probably enact a diversion statute with respect to which the Northwest may not have its interests fully protected. (Robinson-Florida)
W71-07487

SURFACE WATER IN SOUTH CAROLINA,
William T. Toal.
South Carolina Law Review, Vol 23, No 1, p 82-92, 1971. 76 ref.

Descriptors: *South Carolina, *Surface runoff, *Repulsion (Legal aspects), *Riddance (Legal aspects), Surface drainage, Water spreading, Surface waters, Drainage water, Overland flow, Storm runoff, Water sources, Runoff, Water law, Legal aspects, Damages, Compensation.

The law of surface waters in South Carolina is the subject of this note. There are three basic rules for the disposal of surface waters: (1) the common enemy rule, (2) the civil law rule, and (3) the reasonable use rule. South Carolina generally follows the common enemy rule, which allows every landowner to protect his porperty from surface waters even if he throws it back upon a coterminous landowner to his damage. However, landowners may not create a nuisance in disposing of surface waters. This exception has been very limited in use. Another exception is that a landowner cannot collect surface waters in an artificial channel and discharge it in concentrated form upon his neighbor's land. The author maintains that the rejection of negligence and reasonable use concepts is consistent with the common enemy rule but no longer makes any sense because South Carolina has become less agrarian. The South Carolina constitution provides that private property shall not be taken for public use without compensation. This clause has been used to hold the state liable for damages caused by the state with surface waters. (Robinson-Florida)
W71-07488

PROPOSED AGREEMENT FOR ASSUMPTION OF CERTAIN AEC REGULATORY AUTHORITY.
Federal Register, Vol 35, No 220, p 17369-17375, Wednesday, November 11, 1970.

Descriptors: *Maryland, *Nuclear wastes, *Radioactive waste disposal, *Water pollution control, Administrative agencies, Administrative decisions, Regulation, Administration, Nuclear powerplants, Nuclear reactors, Radioactive wastes, Water pollution sources, Pollutants, Pollution abatement, Waste disposal, Federal government, Water pollution, Water pollution treatment, Water quality, Water quality control, Legal aspects, Water resources, Jurisdiction, State jurisdiction.

Notice is hereby published of a proposed agreement received from the Governor of Maryland which provides for the assumption of certain of the Atomic Energy Commission's authority pursuant to section 274 of the Atomic Energy Act. The Commission herein publishes a proposed memorandum of understanding between the State of Maryland and the Commission which would accompany the agreement. The memorandum is drafted to facilitate agreement with the state, pending resolution of the jurisdictional issue raised by the Maryland Department of Water Resources in attempting to impose limits upon radionuclide concentrations in liquid wastes discharged by a Baltimore Gas and Electric Company's nuclear power station. The proposed agreement would give the state regulatory authority over the disposal into the ocean or sea of byproducts, sources, or special nuclear waste materials. The proposed memorandum specifies that nothing therein nor in the proposed agreement shall affect their respective legal position on the question raised by the Maryland Department of Water Resources. (Robinson-Florida)
W71-07489

PUBLIC USE OF CERTAIN LAKE AND RESERVOIR AREAS.
Corps of Engineers, Washington, D.C.

Federal Register, Vol 36, No 45, p 4494-4498, Saturday, March 6, 1971.

Descriptors: *Lakes, *Reservoirs, *Recreation, *Regulation, Public benefits, Boating, Camping, Fishing, Hunting, Swimming, National parks, Recreation facilities, Water policy, Boats, Federal government, Administration.

Regulations are promulgated by the Corps of Engineers for public use of lakes and reservoirs in the states of: Arkansas, California, Colorado, Connecticut, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Massachusetts, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, and West Virginia. Specific sites are listed in each state, and the following subjects are regulated: boating, swimming, hunting and fishing, camping, picnicing, access to public waters, destruction of public property, use of firearms and explosives, gasoline storage, sanitation, advertisements, solicitation for business, commercial operations, recreational activity programs, abandonment of personal property, discrimination, control of animals and pets, visiting hours, noise, and vehicles. (Hart-Florida)
W71-07490

SALINE WATER CONVERSION PROGRAM--APPROPRIATION.
HR Rep No 858, 91st Cong, 2d Sess, 4 US Code Cong and Admin News, p 764-769, 1970. 6 p.

Descriptors: *Saline water, *Desalination, *Desalination plants, *Legislation, Federal government, Administrative agencies, Administration, Budgeting, Financing, Government finance.

The legislative history of Public Law 91-221, an appropriations measure for the saline water conversion program, is set forth in this House report. The stated purpose of the bill is to authorize appropriations for continuance of the desalting research program of the Department of the Interior. Federal activity in the area began in 1952. The program has enlarged in scope and duration, and annual appropriations are now required. The present bill is the second annual appropriation. Committee amendments: (1) reduced the authorization by $500,000, (2) conveyed limited authority for foreign research, (3) deleted changes in the basic act, and (4) provided technical and clarifying language. Categories of activities for which expenditures have been established are: (1) research and development--$16,650,000; (2) development of

saline water conversion test beds--$5,000,000; (3) development of saline water conversion modules--$5,345,000; and (4) administration and coordination--$2,378,000. The report expresses confidence in the present management of the saline water conversion program, resulting from prudent utilization of prior appropriations and the achievement of discernable results. (Hart-Florida)
W71-07491

WATER AND ENVIRONMENTAL QUALITY IMPROVEMENT ACT OF 1970.
Conf Rep No 940, 91st Cong, 2d Sess, 4 US Code Cong and Admin News, p 830-868, 1970. 39 p.

Descriptors: *Water qulaity control, *Environment, *Administrative agencies, *Pollution abatement, Pollutants, Oil, Oil industry, Water pollution, Water pollution control, Water pollution sources, Water quality, Administration, Federal government, United States, Ships, Sewage, Sewage disposal, Legislation, Ecology, Legal aspects, Alaska.
Identifiers: *Water and Environ. Quality Improv. Act.

Since the Senate and House of Representatives disagreed as to an amendment to the Federal Water Pollution Control Act, called the Water and Environmental Quality Improvement Act of 1970, a joint conference was held to draft a mutually-agreeable amendment. The House bill, Senate amendment, and compromise substitute provisions for control of pollution by oil are discussed first. The counterpart House, Senate, and compromise solutions to the following problem areas are set forth and cover: (1) control of hazardous polluting substances; (2) control of sewage from vessels; (3) area acid and other minewater pollution control demonstrations; (4) pollution control in the Great Lakes; (5) training grants and contracts; (6) Alaska village facilities; (7) cooperation by federal agencies in the control of pollution; (8) awards for excellence; (9) research, investigations, training, and information; (10) Oil Pollution Act of 1924; (11) financing study; (12) name change; (13) reimbursement; (14) navigation; and (15) environmental quality. (Hart-Florida)
W71-07492

THE LAW OF WATER USAGE,
Charles W. Wixon, and Karl F. Zeisler.
In: Industrial Uses of Water in Michigan, p 102-136, Bureau of Business Research, University of Michigan, Ann Arbor, 1966. 1 tab, 25 ref.

Descriptors: *Michigan, *Reasonable use, *Prior appropriation, *Consumptive use, Water Quality Act, Water Resources Planning Act, Rivers and Harbors Act, Legislation, Water rights, United States, Federal jurisdiction, Federal-state water rights conflicts, Waste disposal, Water users, Water pollution, Judicial decisions, Riparian rights, Artificial use, Pollution abatement, Remedies, Nuclear wastes, Administrative agencies, Legal aspects, Water law.

This discussion of water law and legislation in the United States, and specifically Michigan, reveals the weaknesses of the present situation. Federal jurisdiction has been extended over all navigable waters, thus creating federal-state conflicts. The federal Water Quality Act and Water Resources Planning Act have created mixed fears among the states, especially as to the former. While federal law deals with disposal of water wastes, state laws cover rights to use water. These state laws, based largely on common law, are not clear. There are few Michigan statutes in the area. The two basic common law doctrines in the United States are the Eastern reasonable use doctrine, applicable in Michigan, and the Western prior appropriation doctrine. A discussion of their differences points to the inherent weaknesses of the reasonable use doctrine. The larger the user or the number of users, the weaker is the law. Legislation and water laws of other states are discussed. Water law must be put on a statutory basis, as the common law has led to many unsolved problems. The Model Water Act provides a flexible starting point for the task. (Smiljanich-Florida)
W71-07493

OIL POLLUTION OF COASTAL AND INLAND WATERS OF THE UNITED STATES UNDER THE WATER QUALITY IMPROVEMENT ACT OF 1970,
Alfred A. Lohne.
Insurance Counsel Journal, Vol 38, No 1, p 49-62, 1971. 73 ref.

Descriptors: *Oil wastes, *Accidents, *Water pollution control, *Pollution abatement, Damages, Oily water, Water pollution sources, Water pollution treatment, Oil, Ships, Federal government, Legislation, Legal aspects, Remedies, Water pollution, Water pollution effects, Jurisdiction, Rivers and Harbors Act.
Identifiers: *Water Quality Improv. Act.

Oil pollution of coastal and inland waters, as affected by the Water Quality Improvement Act of 1970, is the central topic of this article. Discussed as the background for the Water Quality Improvement Act are: (1) the Water Pollution Act of 1886, (2) the River and Harbor Act of 1899, (3) the Oil Pollution Act of 1924, (4) the Oil Pollution Act of 1961, and (5) the 1966 Clean Water Restoration Act. The Water Quality Improvement Act provides for: a National Contingency Plan, a basis and amount of liability, claims against the United States, jurisdiction, evidence of financial responsiblility, direct suits against underwriters, and offshore rigs. The Act does not concern private suits, but the National Contingency Plan will greatly assist private landowners in cleaning their lands and waters. While the Act will not prevent all accidents, it provides measures for a rapid cleanup at the expense of the polluter. These expenses will be recoverable in the appropriate district court. There are four exceptions to the strict liability of the polluter: (1) an act of God, (2) an act of war, (3) negligence on the part of the United States, and (4) an act or omission of a third party. (Robinson-Florida)
W71-07494

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
For primary bibliographic entry see Field 05G.
W71-07495

PROMISING AREAS FOR RESEARCH ON INSTITUTIONAL DESIGN FOR WATER RESOURCES MANAGEMENT,
Wisconsin Univ., Madison. Dept. of Urban and Regional Planning.
For primary bibliographic entry see Field 06B.
W71-07498

A NEW LOOK AT NATIONAL WATER POLICY,
National Water Commission, Arlington, Va.
For primary bibliographic entry see Field 06B.
W71-07500

ECONOMIC AND INSTITUTIONAL ASPECTS OF WATER TRANSFERS IN NORTHWEST NEVADA,
Nevada Univ., Reno. Dept. of Agricultural and Resource Economics.
John G. McNeely.
Agricultural Experiment Station Report B27, Jan 1971. 29 p, 12 tab, 1 fig, 27 ref.

Descriptors: *Water transfer, Inter-basin transfers, Water users, *Appropriation, Water rights, *Institution, Evaluation, *Nevada.
Identifiers: *Truckee River Basin, Truckee-Carson Irrigation District, Sierra Pacific Power Company.

Although the author describes how Nevada's appropriative type of water law has worked relatively well, he states that 'it would be erroneous to conclude that its operation cannot be improved.' By focusing on the Truckee River Basin in northwestern Nevada he was able to study specifically how water rights have been transferred from one use to another in Nevada and the role that legal and institutional arrangements have played in these transfers. Since 1944, the author stated, 18,326 acre-feet of water transfers have taken place on the Truckee River, representing primarily changes from irrigation to municipal and industrial uses. He concludes that if improvements in Nevada's legal and institutional arrangements were made, such as enforcement of Nevada's law regarding non-use of water, non-transferability of Newland Project water and offering incentives for more efficient use of water, increased water transfers could take place and the economy of the Truckee River Basin could gain increased benefits. (Holmes-Rutgers)
W71-07504

EFFICIENT DISTRIBUTION OF RESOURCES THROUGH THREE LEVELS OF GOVERNMENT,
Dalhousie Univ., Halifax (Nova Scotia); and Texas Univ., Austin, Tex.
R. M. Cassidy, M. J. L. Kirby, and W. M. Raike.
Management Science, Vol 17, No 8, B462-B473, Apr 1971.

Descriptors: *Resource allocation, Decision-making, Economic efficiency, Cost, Budget constraint, Dynamic programming, Cost.
Identifiers: *Algorithm, Objective function, Parametric statistics, Matrix.

This paper presents a model for determining how a central government or authority can most efficiently allocate resources among other levels of government. The model takes into account both the initial allocation by the higher level government body and the usage of resources that is determined by the lower level unit. A key feature of the model is the mathematical formulation of the central government's objective of distributing resources efficiently while at the same time being as fair as possible to all those receiving allocations. The authors then propose a solution technique which uses either parametric analysis or dynamic programming. Illustrative examples are given to clarify the model and the solution approach. This article is relevant to water research concerned with intergovernmental budgetary relations and resource allocation. (Siegenthaler-Rutgers)
W71-07579

THE SYMMETRY APPROACH TO COMMITTEE DECISIONS: AN EMPIRICAL STUDY OF A LOCAL GOVERNMENT BUDGET COMMITTEE,
Wayne State Univ., Detroit, Mich.
For primary bibliographic entry see Field 06B.
W71-07588

BUDGETING AND DECISIONMAKING PROCESS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 06B.
W71-07594

LAW AND THE MUNICIPAL ECOLOGY, AIR, WATER, NOISE, OVER-POPULATION,
National Inst. of Municipal Law Officers, Washington, D.C.
Stuart F. Lewin, Alan H. Gordon, and Channing J. Hartelius.
NIMLO Research Report 156, 1970. 243 p.

Descriptors: *Legislation, *Air pollution, *Water pollution, Human population, *Ecology, *Social aspects, *Legal aspects.
Identifiers: Federal regulations, Interstate compacts, State regulations, Local regulations.

The major municipal pollution problems result from man's interaction with his environment. To improve this municipal environment the city attorney must be provided with the legal means to bring about the desired relationship. The definition, scope, types, and effects of pollution are considered in conjunction with the role of municipal law. A discussion of the federal, state and municipal regulations for the city attorney's enforcement of controls on over-population and air, water, and noise pollution is presented. (Ensign-PAI)
W71-07670

WATER RESOURCES ACTIVITIES IN THE UNITED STATES-POLLUTION ABATEMENT.

Senate Select Comm on National Water Resources, S Res 48, 86th Cong, 2d Sess (1960). 38 p, append.

Descriptors: *Water pollution sources, *Water pollution effects, *Domestic wastes, *Industrial wastes, Water pollution, Organic wastes, Sewage disposal, Wastes, Waste treatment, Water pollution treatment, Water quality, Sewage disposal, Municipal wastes, Sewage, Waste water (Pollution), Pollutant identification, Organic acids, Inorganic compounds, Organic pesticides, Thermal pollution, Pollutants, Pollution abatement, Radioactive wastes, Radioactive waste disposal, Groundwater.

Water polluting substances are classified and discussed in eight general categories: (1) oxygen demanding wastes, including sewage; (2) infectious agents; (3) plant nutrients; (4) organic chemical exotics including detergents and pesticides; (5) other chemical and mineral substances; (6) sediments; (7) radioactive substances; and (8) heat. Special problems involving all categories are discussed with relation to industrial and municipal wastes, with emphasis on the effects of pollutants on potential uses of the affected waters, problems of groundwater pollution and the effects of such pollution on future water needs. Numerous charts and tables illustrate pollutant loads, waste treatment and pollution elimination costs projected to the year 2000, and prevalence of various pollutants in different areas. Appendices treat pollution-related subjects in thirteen water resources regions. (Dye-Florida)
W71-07674

THE USE OF TAXES, SUBSIDIES, AND REGULATIONS TO EFFECT AN IMPROVED ALLOCATION OF WATER RESOURCES,
Clemson Univ., S.C. Water Resources Research Inst.
H. Macaulay.
Final Report, Aug 1967. 24 p, 3 fig, 14 ref. OWRR Project A-008-SC (1).

Descriptors: *Regulations, *Subsidies, *Taxes, *Water allocation (Policy), Water pollution, Water pollution control, Water pollution treatment, Pollutants, Pollution abatement, Water resources, Effluents, Administrative agencies, Distribution, Preferences (Water rights), Water demand, Water supply.

Water, long considered plentiful, is becoming so scarce as to require a means of allocation. Since water has not been subject to private ownership, and there has been no general supervision of water usage, the problems of water allocation are more complex than with other commodities. The solutions most often proposed for water allocation are: (1) regulations imposed by governments for water use; (2) subsidies to be granted to firms and municipalities for the removal of wastes which lower water quality; and (3) a tax or effluent charge levied on wastes discharged into streams or other bodies of water. Evaluation of these proposals indicates that, although regulations could provide for optimum economic water use, they have not accomplished that objective. Despite the assertion that effluent charges are licenses to pollute, such charges do not license the unlimited discharge of pollutants, but of only specified amounts. Subsidies for pollution abatement, since financed by all taxpayers, are the most just means of water allocation and pollution control. (Hart-Florida)
W71-07686

PREDICTION OF WATERSHED DEVELOPMENT SUCCESS OF LOCAL COMMUNITIES,
Department of Agriculture, Upper Darby, Pa. Economic Research Div.
For primary bibliographic entry see Field 06B.
W71-07694

PROCEEDINGS, CONFERENCE ON POLLUTION OF THE INTERSTATE WATERS OF LAKE CHAMPLAIN AND ITS TRIBUTARY BASIN - NEW YORK - VERMONT.
For primary bibliographic entry see Field 05G.
W71-07697

6F. Nonstructural Alternatives

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07063

PROTECTING OUR ENVIRONMENT AND NATURAL RESOURCES IN THE 1970's,
For primary bibliographic entry see Field 05G.
W71-07495

6G. Ecologic Impact of Water Development

ENVIRONMENTAL CONSIDERATIONS IN THE RECYCLING OF HIGH TEMPERATURE WATER,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05C.
W71-07161

THE NATIONAL ESTUARINE POLLUTION STUDY.
Secretary of the Interior, Washington, D.C.
For primary bibliographic entry see Field 05G.
W71-07215

INFORMATION FOR THE FUTURE: THE WEST SIDE SAN JOAQUIN VALLEY PROJECT.
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 06B.
W71-07241

ENVIRONMENTAL IMPACT OF THE CROSS-FLORIDA BARGE CANAL WITH SPECIAL EMPHASIS ON THE OKLAWAHA REGIONAL ECOSYSTEM.
Florida Defenders of the Environment, Inc., Gainesville.

Report of Florida Defenders of the Environment, Gainesville, Fla, Jan 1971. 33 fig, 1 tab, 10 ref.

Descriptors: *Canal construction, *Ecology, *Geology, *Hydrology, *Land use, *Economics, Ecosystems, Construction, Florida.

The United States Army Corps of Engineers is constructing the Cross-Florida Barge Canal. The environmental impact of this construction has been studied with emphasis on the ecosystem of the Oklawaha region. The principal findings of studies in geology, ecology, hydrology, economics, land use planning, and environmental quality are summarized. Recommendations from these findings are suggested. (Ensign-PAI)
W71-07332

CONFLICTS OF RECREATION AND OTHER USES OF THE GREAT LAKES,
Department of the Interior, Washington, D.C.
For primary bibliographic entry see Field 06B.
W71-07570

A GEOLOGIST VIEWS THE ENVIRONMENT,
Illinois State Geological Survey, Urbana.
John C. Frye.
Illinois Geological Survey Environmental Geology Notes, No 42, Feb 1971. 9 p.

Descriptors: *Land use, *Geology, *Environment, *Reviews, *Earth (Planet), Geomorphology, Evaluation, Methodology, Urbanization, Land use, Waste disposal, Water supply, Mineralogy, Structures, Water resources.
Identifiers: *Environmental geology.

The contributions of the earth scientist to environmental problem solving are discussed under five general categories. The first of these is collecting data for planning the proper use of the terrane, or the most efficient adjustment of man's use of the earth's surface to all of the physical features and characteristics at and below the surface - particularly in expanding urban areas. Second is determination of the factors that influence the safety and permanence of disposal of waste materials and trash of all kinds - both in the rocks near the surface and at great depth in mines and wells. Third is providing information for the planning and development of safe, adequate, and continuing water supplies in locations that will serve populated areas. Fourth is the identification of rock and mineral resources to provide for future availability of needed raw materials, or of appropriate substitute materials. And, fifth is the recognition of man as a major geologic agent by monitoring the changes he has caused in his environment and by providing remedies where these changes are, or may become, harmful. (Woodard-USGS)
W71-07605

LAW AND THE MUNICIPAL ECOLOGY, AIR, WATER, NOISE, OVER-POPULATION,
National Inst. of Municipal Law Officers, Washington, D.C.
For primary bibliographic entry see Field 06E.
W71-07670

A DETAILED ANALYSIS OF CLIMATOLOGICAL AND HYDROLOGICAL RECORDS OF SOUTH FLORIDA WITH REFERENCE TO MAN'S INFLUENCE UPON ECOSYSTEM EVOLUTION,
Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
For primary bibliographic entry see Field 02A.
W71-07672

07. RESOURCES DATA

7A. Network Design

A PROPOSED STREAMFLOW DATA PROGRAM FOR ARKANSAS,
Geological Survey, Little Rock, Ark.
James L. Patterson.
Geological Survey Open-file Report, 1969. 43 p, 3 fig, 4 tab, 6 ref, append.

Descriptors: *Streamflow, *Network design, *Data collections, *Arkansas, Planning, Hydrologic data, Stream gages, Regression analysis, Natural flow, Regulated flow, Surface waters, Gaging stations.
Identifiers: Streamflow-data evaluation.

An evaluation of the streamflow data available in Arkansas was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. Many of the goals could be met by generalization of the data for gaged basins by regression analysis. Changes can be made in the present data program to attain the goals that have not been met. A streamflow data program, based on the guidelines developed, is proposed. (Woodard-USGS)
W71-07254

A PROPOSED STREAMFLOW DATA PROGRAM FOR PENNSYLVANIA,
Geological Survey, Harrisburg, Pa.
Leland V. Page.
Pennsylvania Department of Forests and Waters Technical Bulletin No 3, 1970. 55 p, 3 fig, 4 tab, 10 ref, append.

Descriptors: *Streamflow, *Network design, *Pennsylvania, *Data collections, Reviews, Planning, Stream gages, Natural flow, Regulated flow, Hydrologic data, Gaging stations, Flow characteristics.
Identifiers: *Streamflow characteristics.

An evaluation of the streamflow data available in Pennsylvania was made to provide guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of the long-germ goals of the streamflow-data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining objectives. It was found that many of the goals could be met by generalization of the data for gaged basins by regression analysis. A stream-flow-data program based on the guidelines developed in this study is proposed. The current network is reasonably comprehensive but additional stations are needed to better define the limestone-sandstone index. (Woodard-USGS)
W71-07299

A PROPOSED STREAMFLOW DATA PROGRAM FOR MARYLAND AND DELAWARE,
Geological Survey, Towson, Md.
William E. Forrest, and Patrick N. Walker.
Geological Survey Open-file Report, 1970. 41 p, 1 fig, 8 tab, 6 ref, 1 plate, append.

Descriptors: *Streamflow, *Network design, *Data collections, *Maryland, Planning, Hydrologic data, Stream gages, Regression analysis, Flow characteristics, Natural flow, Regulated flow, Gaging stations.
Identifiers: Streamflow-data evaluation, Streamflow characteristics.

An evaluation of the streamflow data available in Maryland and Delaware provides guidelines for planning future programs. The basic steps in the evaluation procedure were (1) definition of long-term goals of the streamflow data program in quantitative form, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternate programs and techniques to meet the remaining goals. Although most of the goals were not met by generalization of the data for gaged basins by regression analysis, it is still possible to make significant changes in the present data program to assist in attaining the goals. A streamflow data program based on the guidelines developed is proposed for the future. (Woodard-USGS)
W71-07300

A PROPOSED STREAMFLOW DATA PROGRAM FOR MINNESOTA,
Geological Survey, St. Paul, Minn.
William B. Mann, IV, and Charles R. Collier.
Geological Survey Open-file Report, Sept 1970. 75 p, 4 fig, 8 tab, 10 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *Minnesota, Planning, Hydrologic data, Stream gages, Regression analysis, Flow characteristics, Natural flow, Regulated flow, Gaging stations.
Identifiers: Streamflow-data evaluation.

An evaluation of the streamflow data in Minnesota provides guidelines for planning future programs. The principal steps in this evaluation were (1) establishing the objectives and goals of the program, (2) examining and analyzing all available data to determine which of the goals have been met, (3) considering alternate means of meeting the remaining goals, and (4) identifying elements that should be included in the future program. Regression analysis of generalized data did not meet the established accuracy criteria. Significant changes must be made in the present data-collection program to meet these goals. Analysis on a regional basis is one way in which the accuracy can be improved. There are 105 current-purpose stations which should be continued as well as 137 crest-stage partial-record stations and about 400 low-flow sites. Seven minor stream-gaging stations and 13 natural-flow, principal-stream stations are recommended for discontinuance. Establishment of 53 new gaging stations is recommended. (Woodard-USGS)
W71-07301

A PROPOSED STREAMFLOW-DATA PROGRAM FOR MONTANA,
Geological Survey, Helena, Mont.
F. C. Boner, and G. W. Buswell.
Geological Survey Open-file Report, 1970. 96 p, 4 fig, 9 tab, 16 ref.

Descriptors: *Streamflow, *Network design, *Data collections, *Montana, Planning, Hydrologic data, Stream gages, Regression analysis, Natural flow, Regulated flow, Surface waters, Gaging stations.
Identifiers: Streamflow characteristics, Data evaluation.

An evaluation of the streamflow data available in Montana was made to provide guidelines for planning future programs. The basic steps in the evaluation procedures were (1) definition of the long-term goals of the streamflow data program, (2) examination and analysis of all available data to determine which goals have already been met, and (3) consideration of alternatate programs and techniques to meet remaining goals. Only one of the goals was met by generalization of the data for gaged basins by regression analysis. The regression method may be more successful at a future time if a more suitable model can be developed, and if an adequate sample of streamflow records can be obtained. In the meantime, other methods of transferring flow characteristics which require some information at the ungaged site may be used. A streamflow data program, based on the guidelines developed, is proposed. (Woodard-USGS)
W71-07302

PERIODIC REPORT OF THE WATER QUALITY SURVEILLANCE NETWORK, 1965 THRU 1967 WATER YEARS.
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 05A.
W71-07635

A PROPOSED STREAMFLOW-DATA PROGRAM IN ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.
Joseph M. Childers.
Geological Survey Alaska District Open-file Report, 1970. 55 p, 7 fig, 9 tab, 5 ref, 2 append.

Descriptors: *Streamflow, *Network design, *Data collections, *Alaska, Planning, Gaging stations, Stream gages, Hydrologic data, Regression analysis, Natural flow, Regulated flow, Surface waters, Precipitation (Atmospheric).
Identifiers: Streamflow characteristics, Data evaluation.

The streamflow-data program in Alaska was analyzed to design a better data-collection network. The analysis included (1) definition of the goals of the streamflow-data program, (2) evaluation of the available data to see which goals have already been achieved, and (3) consideration and recommendation of future programs to achieve the goals that have not been met. Few of the goals have been met. Many new gaging stations are proposed to provide data to reach the remaining goals. Also, other data collections are proposed to supplement the gaging-station data. (Woodard-USGS)
W71-07636

7B. Data Acquisition

ADVANCING TECHNOLOGY IN ELECTRONIC SURVEYING,
Plessey Electronics Corp., Farmingdale, N.Y.
C. G. Romaniello.
Proceedings American Society of Civil Engineers, Journal of the Surveying and Mapping Division, Vol 96, No SU2, p 287-297, Sept 1970. 11 p, 3 fig, 5 tab, 5 ref, 2 append.

Descriptors: Accuracy, *Measuring instruments, Distance, Electronics, *Electronic equipment, Geodimeters, Microwaves, Performance, *Surveying instruments, Refractivity, *Surveying, Technology, History, Radio waves, Radar, Errors, Infrared radiation, Light waves, Tellurometers.
Identifiers: Resolution.

Changes in electronic distance measurement equipment have evolved rapidly and dramatically. The use of higher frequencies with resulting narrower beam widths and higher resolutions has concurred with the advances in electronics. Performance capabilities of the earlier microwave instruments in the X and S band categories are analyzed and equations applied. Values of refractive indexes and the accuracy limiting factors are discussed. Equipment comparison tables show the range and accuracies of available instruments. The more modern high-accuracy devices and the improved techniques required for full capitalization on their capabilities are reviewed. Future trends are outlined as they are predicated on the changing needs of the involved professions. (USBR)
W71-07071

STUDIES OF PROPERTIES AND CONDITIONS OF ROCK MASSIFS BY SEISMIC ACOUSTICS METHODS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Meloratsii, Moscow (USSR).
For primary bibliographic entry see Field 08E.
W71-07074

DETERMINATION OF IN SITU HYDRAULIC PARAMETERS IN JOINTED ROCK,
Imperial Coll. of Science and Technology, London (England).
For primary bibliographic entry see Field 02F.
W71-07075

A NEW AUTOMATIC DETERMINATION OF OXYGEN IN ORGANIC SUBSTANCES BY COLORIMETRIC TITRATION, (IN GERMAN),
Badische Anilin- und Soda-Fabrik A.G., Ludwigshafen am Rhein (West Germany).
For primary bibliographic entry see Field 05A.
W71-07349

INVESTIGATION OF PHOTOSYNTHETIC TRANSIENTS IN CHLORELLA USING RADIOACTIVE CARBON DIOXIDE (IN GERMAN),
Frankfurt Univ. (West Germany). Botanical Inst.; and Tuebingen Univ. (West Germany). Institut fuer Chemische Pflanzenphysiologie.
G. Dochler, and K. Wegmann.
English summary. Planta, Vol 89, p 266-274, 1969. 3 fig, 13 ref.

Descriptors: *Investigations, *Radioactivity techniques, Photosynthesis, Chlorella, Data collections, Radioactivity.
Identifiers: *Photosynthetic transients, Chlorella vulgaris, Carbon dioxide-14, Calvin cycle, Photorespiration, Carboxylation pathways.

The strain 211-11f of Chlorella vulgaris, grown with a low concentration of carbon dioxide, was used as the test plant. Under conditions of the study, conducted in environment with 0.7% carbon dioxide, by volume, no transients in carbon dioxide-14 fixation was observed. Autoradiographic investigation showed at the beginning of illumination the appearance of radioactivity in the intermediates of the Calvin cycle. After two minutes some radioactivity was incorporated in malate and aspartate. Under the influence of iodoacetamide in concentration of 0.001 M, the radioactivity was located in malate, aspartate, and 3-phosphoglycerate. Consideration is given to the formation of the transients by two different pathways of carboxylation and the role of photorespiration. (Wilde-Wisconsin)
W71-07350

PHOTOSYNTHETIC COEFFICIENT AS A FUNCTION OF THE COMPOSITION OF PLANT BIOMASS, (IN RUSSIAN),
Institut Mediko-Biolozicheskikh Problem, Moscow (USSR).
For primary bibliographic entry see Field 05C.
W71-07359

CONTINUOUS MONITORING OF AROMATIC COMPOUNDS IN WATER BY DIFFERENTIAL PHOTOMETRY,
Du Pont de Nemours (E. I.) and Co., Wilmington, Del.
For primary bibliographic entry see Field 05A.
W71-07404

A NEW RAPID METHOD FOR THE PRODUCTION OF PERMANENT STAINED SLIDES OF MARINE PLANKTON,
Connecticut Coll., New London. Marine Science Program.
For primary bibliographic entry see Field 05A.
W71-07408

AUTOMATED COUNTING OF MICROBIAL COLONIES,
Minnesota Univ., Minneapolis. Dept. of Chemical Engineering; and Minnesota Univ., Minneapolis. Dept. of Microbiology.
For primary bibliographic entry see Field 05A.
W71-07411

AERIAL SURVEYS OF GREAT LAKES WATER TEMPERATURES, APRIL, 1966 to MARCH, 1968,
Department of Transport, Toronto (Ontario). Meteorological Branch.
For primary bibliographic entry see Field 05B.
W71-07419

PHOTOGRAPHY AND OTHER REMOTE SENSING OF WATER POLLUTION,
For primary bibliographic entry see Field 05G.
W71-07538

PRIME NEED: INSTRUMENTS FOR USE IN FIELD,
For primary bibliographic entry see Field 05A.
W71-07540

MEASURING THE HYDRAULIC POTENTIAL OF GROUNDWATER WITH THE HYDRAULIC POTENTIAL PROBE,
Grontmij N.V., Bilt (Netherlands).
B. Fokkens, and J. Weijenberg.
Journal of Hydrology, Vol 6, No 3, p 306-313, 1968. 8 p, 3 fig, 2 tab, 2 ref.

Descriptors: *Piezometers, *Groundwater movement, *Saturated soils, *Hydraulic conductivity, *Potentiometers, Methodology, Testing, Test procedures, Soil moisture meters, Manometers, Moisture tension.
Identifiers: *Hydraulic potential probe.

The 'potential probe' is a new instrument to measure hydraulic potentials in saturated soils, without disturbing the soil profile. The basic lag time of the apparatus is about 15 times shorter than that of normal one-inch-tube piezometers. A hollow steel needle with an outer diameter of 2 mm is connected with a manometer. This is the measuring needle which is closed at the lower end and provided with an opening one cm above the bottom. A mantle needle around the measuring needle can be moved over this opening. The manometer is made of a plastic laboratory tube with an inner diameter of 2 mm. This manometer can be closed at the upper end with a clip. The manometer is fitted on a lath which is clenched to a rod. This rod is pressed into the soil. The length of the measuring needle and the height of the manometer are 100 cm. The operation of the instrument is explained, and the data obtained are given. (Woodard-USGS)
W71-07630

DETERMINING WATER DISCHARGE BY ELECTROLYSIS WITHOUT FIELD CALIBRATION OF ELECTRODES (OPREDELENIYE RASKHODOV VODY ELEKTROLITICHESKIM SPOSOBOM BEZ POLEVOY TARIROVKI ELEKTRODOV),
For primary bibliographic entry see Field 02E.
W71-07658

7C. Evaluation, Processing and Publication

OPSET: PROGRAM FOR COMPUTERIZED SELECTION OF WATERSHED PARAMETER VALUES FOR THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07061

THE STANFORD WATERSHED MODEL: THE CORRELATION OF PARAMETER VALUES SELECTED BY A COMPUTERIZED PROCEDURE WITH MEASURABLE PHYSICAL CHARACTERISTICS OF THE WATERSHED,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07062

AN EVALUATION OF RELATIONSHIPS BETWEEN STREAMFLOW PATTERNS AND WATERSHED CHARACTERISTICS THROUGH THE USE OF OPSET: A SELF CALIBRATING VERSION OF THE STANFORD WATERSHED MODEL,
Kentucky Water Resources Inst., Lexington.
For primary bibliographic entry see Field 02A.
W71-07063

CARBON BUDGET AND TOTAL PRODUCTIVITY OF AN ESTUARINE OXIDATION POND RECEIVING SECONDARY SEWAGE EFFLUENT,
Institute for Environmental Health Studies, Morehead City, N.C.
For primary bibliographic entry see Field 05D.
W71-07092

SERIAL CORRELATION IN ANNUAL STREAM RUNOFF,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W71-07151

ANALYSIS AND EVALUATION OF PUMPING TEST DATA,
International Inst. for Land Reclamation and Improvement, Wageningen (Netherlands); and Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 02F.
W71-07166

WATER RELATED LAND USE IN THE WEBER RIVER DRAINAGE AREA,
Utah Dept. of Natural Resources. Div. of Water Rights.
For primary bibliographic entry see Field 04A.
W71-07167

CHARACTERIZATION OF WATER TABLES IN OREGON SOILS WITH REFERENCE TO TRAFFICABILITY,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 02F.
W71-07173

URBAN HYDROLOGY, HOUSTON METROPOLITAN AREA, TEXAS - 1968,
Geological Survey, Houston, Tex.
For primary bibliographic entry see Field 04C.
W71-07184

CHARACTERISTICS OF NEW YORK LAKES: PART 1A--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY COUNTIES,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02H.
W71-07185

CHARACTERISTICS OF NEW YORK LAKES: PART 1B--GAZETTEER OF LAKES, PONDS, AND RESERVOIRS BY DRAINAGE BASINS,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 02H.
W71-07186

AN APPROACH TO THE SELECTION OF A STREAMFLOW BASE PERIOD,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 02E.
W71-07188

DEVELOPMENT OF A STATEWIDE SYSTEM FOR COMPUTER PROCESSING OF HYDROGEOLOGICAL DATA,
Montana Bureau of Mines and Geology, Butte.
M. K. Botz.
Available from Montana Bureau of Mines and Geology 203-B Main Hall, Montana College of Mineral Science and Technology, Butte, Montana 59701. Montana Bureau of Mines and Geology Special Publication 49, 1970. 35 p, 3 fig, 2 tab, 25 ref. OWRR Project A-014-MONT (1).

Descriptors: *Montana, *Data processing, *Data storage and retrieval, *Hydrologic data, Hydrogeology, Water quality, Computer programs,

Digital computers, Planning, Water management (Applied).
Identifiers: *Hydrogeological data processing.

Numerous computer-oriented data-processing systems used to store, retrieve, and manipulate hydrogeological data are reviewed for their suitability for use in Montana. The US Geological Survey and the Canadian government have developed nationwide groundwater data-processing systems. The Federal Water Pollution Control Administration STORET system, systems used by the oil industry, and systems used in other states also may be of use in the development of a statewide groundwater data-processing system. Of the available processing systems, the US Geological Survey system is the most nearly complete and most useful for statewide use, but even this system is too limited in scope and flexibility. Planning and development of a comprehensive statewide hydrogeological data-processing system requires a computer facility, considerable funds, and skilled personnel. (Knapp-USGS)
W71-07239

GAZETTEER OF LOUISIANA LAKES AND RESERVOIRS,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 02H.
W71-07247

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR DEEP CREEK, COLORADO RIVER BASIN, TEXAS, 1969,
Geological Survey, Austin, Tex.
H. R. Hejl, Jr.
Geological Survey Data Report, Feb 1971. 73 p, 2 fig, 3 tab.

Descriptors: *Rainfall-runoff relationships, *Streamflow, *Hydrologic data, *Colorado River basin, *Texas, Data collections, Flood control, Control structures, Stream gages, Flow characteristics, Gaging stations, Hydrographs, Surface waters, Mass curves.
Identifiers: *Deep Creek (Tex), Water budget.

This report contains the rainfall, runoff, and storage data collected during the 1969 water year (Oct. 1968-Sept. 1969) for the 43.9-square-mile area above the stream-gaging station Deep Creek near Mercury, Texas, and the 8.31-square-mile area above the stream-gaging station Dry Prong Deep Creek near Mercury, Texas. Six floodwater-retarding structures have been completed in the watershed. Five of these structures are upstream from the stream-gaging station Deep Creek near Mercury. They have a combined capacity of 5,600 acre-feet and regulate floodflow from 19.9 square miles (45%) of the drainage area above the stream-gaging station. The other structure is above the stream-gaging station Dry Prong Deep Creek near Mercury. It has a floodwater-retarding capacity of 1,370 acre-feet and regulates floodflow from 5.41 square miles, or approximately 65% of the drainage area above the stream-gaging station. The weighted-mean rainfall over the Deep Creek area was 30.79 inches and over the Dry Prong Deep Creek area was 30.26 inches. The ratio of rainfall to runoff ranged from 3.9 to 5.7% for the stations with continuous recording gages. (Woodard-USGS)
W71-07251

CALCULATION OF MEAN AREAL DEPTH OF PRECIPITATION,
Tennessee Univ., Knoxville. Dept. of Engineering Mechanics.
For primary bibliographic entry see Field 02B.
W71-07270

SUMMARY AND EVALUATION OF METHODS FOR DETECTING HYDROLOGIC CHANGES,
Agricultural Research Service, Athens, Ga. Southwest Watershed Research Center.
For primary bibliographic entry see Field 02A.
W71-07271

DIGITAL COMPUTER SOLUTIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W71-07273

INITIAL REPORTS OF THE DEEP SEA DRILLING PROJECT, VOL. 6--HONOLULU, HAWAII TO APRA, GUAM, JUNE-AUGUST, 1969.
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 02J.
W71-07287

GROUNDWATER RESOURCES OF ARANSAS COUNTY, TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 02F.
W71-07292

CHARACTERISTICS OF NEW YORK LAKES: PART 1 - GAZETTEER OF LAKES, PONDS, AND RESERVOIRS,
Geological Survey, Albany, N. Y.
For primary bibliographic entry see Field 02H.
W71-07297

SELECTED HYDROLOGIC DATA, CACHE VALLEY, UTAH AND IDAHO,
Geological Survey, Salt Lake City, Utah.
L. J. McGreevy, and L. J. Bjorklund.
Utah Department of Natural Resources Basic - Data Release No 21, 1970. 51 p, 1 fig, 5 tab, 15 ref, 1 plate.

Descriptors: *Groundwater, *Water wells, *Hydrologic data, *Utah, *Idaho, Data collections, Water level fluctuations, Aquifers, Water yield, Specific capacity, Water utilization, Depth, Chemical analysis, Aquifer characteristics, Hydrogeology, Water quality.
Identifiers: *Cache Valley (Utah and Idaho), *Groundwater basic data.

Selected basic data of the groundwater resources of Cache Valley, Utah and Idaho collected since 1935 are presented. The tables of data include well and spring records, water levels, logs of wells, water temperature, and chemical analyses of water samples. (Woodard-USGS)
W71-07303

WATER RESOURCE OBSERVATORY WIND DATA, WATER YEAR 1969 AND PRIOR,
Wyoming Univ., Laramie. Water Resources Research Inst.
Verne E. Smith.
Water Resources Series No 21. 182 p, 20 tab, 1 fig, 1 computer program. OWRR Proj No A-001-WYO (36).

Descriptors: *Climatic data, *Winds, *Data processing, *Anemometers, *Evaporation, Wyoming, Computer programs, Hydrologic cycle, Ecosystems, Instrumentation, Meteorological data, Model studies, Watershed management, Biogeography, Water year.
Identifiers: Snowy Range Water Resource Observatory, Wyoming Water Resources Operations Study.

Wyoming wind data, for the Snowy Range Water Resource Observatory, reduced from recording anemometer charts and from readings of totalizing anemometers are tabulated. Card formats and FORTRAN FOUR computer program are presented. This report is part of the investigation of bio-physical relations in the hydrologic cycle, under the Water Resources Operations Study. This data will be used to develop a hydrologic model of a mountain watershed ecosystem. Data is provided from October 1965 to September 1969. There are 17 stations, 14 of which are totalized, and 3 of which are recorded. There are 20 tables, 1 instrumentation location map, 2 punch card formats and 1 FORTRAN FOUR program of 715 steps. (Popkin-Arizona)
W71-07306

A COMPUTER BASED FLORISTIC ANALYSIS OF PAMLICO RIVER PHYTOPLANKTON,
East Carolina Univ., Greenville, N.C. Dept. of Biology.
For primary bibliographic entry see Field 02L.
W71-07337

THE ESTUARINE VERSION OF THE COLHEAT DIGITAL SIMULATION MODEL,
Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 05B.
W71-07428

HYDROGRAPHIC OBSERVATIONS ON THE RED SEA BRINES INDICATE A MARKED INCREASE IN TEMPERATURE,
Woods Hole Oceanographic Institution, Mass.
P. G. Brewer, T. R. S. Wilson, J. W. Murray, R. G. Munns, and C. D. Densmore.
Nature, Vol 231, No 5297, p 37-38, May 7, 1971. 2 p, 1 fig, 1 tab, 13 ref.

Descriptors: *Sea water, *Water temperature, *Water chemistry, *Brines, *Data collections, Ships, Analytical techniques, Salinity, Iron, Manganese.
Identifiers: *Red Sea, Atlantis II.

The bathymetric and hydrographic data from the expedition of the R/V Chain during November 1966 revealed three deeps in the Red Sea all containing hot brine. During February 1971, R/V Chain revisited the brine area. The most unusual observation is that the temperature of the Atlantis II brine has risen 2.7 deg C from 56.5 deg C to 59.2 deg C in the 51 months since the last published observation. For the 1971 cruise, special high range protected thermometers were used, and it is estimated that these observations were accurate to about 0.05 deg C. The interface between the 59 deg C brine and the intermediate brine seems to have risen by about 6 m since 1966, giving an increase in volume of this brine of about 12%. No significant change was detected in the salinity of the deep Atlantis II brine. Observed increase in dissolved iron and manganese indicates that over the period of observation, the rate of input of these elements in the reduced form has greatly exceeded the rate of deposition of the oxidized form. (Woodard-USGS)
W71-07604

LINEARIZING WEIGHT FACTORS FOR LEAST-SQUARES FITTING,
Toronto Univ. (Ontario). Dept. of Mechanical Engineering.
Llewellyn E. Jones.
ASCE Proceedings, Journal of the Hydraulics Division, Vol 97, No HY 5, Paper 8089, p 665-675, May 1971. 13 p, 2 fig, 5 tab, 12 ref, append.

Descriptors: *Data processing, *Statistics, *Least squares method, *Statistical methods, Correlation analysis, Estimating, Quality control, Systems analysis, Operations research.
Identifiers: *Curve fitting, *Experimental design.

Comprehensive relationships are given for least-squares fitting of linear functions, corresponding to various parametric conditions, but limited to fallibility in either abscissa or ordinate but not in both. For a nonlinear function linearized by suitable change of variable (s), the given least-squares relationships may be used validly if the weights are appropriately altered. The necessary linearizing weight factors are derived and verified in numerical examples. (Knapp-USGS)

W71-07614

DYNAMIC PROGRAMMING FOR CONJUNCTIVE WATER USE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering; and California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 04B.
W71-07616

EVALUATION OF THE STREAMFLOW DATA PROGRAM IN COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 02E.
W71-07634

HYDROLOGIC FACTORS AFFECTING THE UTILIZATION OF LAND FOR SANITARY LANDFILLS IN NORTHERN HILLSBOROUGH COUNTY, FLORIDA,
Geological Survey, Tampa, Fla.
Joseph W. Stewart, and Robert V. Hanan.
Florida Bureau of Geology Map Series No 39, 1970. 1 Sheet, Text, 5 fig, 8 ref.

Descriptors: *Landfills, *Solid wastes, *Water pollution sources, *Florida, Hydrogeology, Land use, Urbanization, Water quality, Surface waters, Groundwater, Topography, Soils, Drainage, Geology, Aquifers, Aquifer characteristics, Sinks, Groundwater movement, Potentiometric level, Planning, Springs, Artesian wells.
Identifiers: *Landfills (Northern Hillsborough County, Fla).

This map report presents an overall picture of the northern part of Hillsborough County, Florida, which should be useful in selecting prospective landfill sites. Included are a number of geologic and hydrologic factors, as well as other existing features, which should be considered in selecting sites for landfill operations. The criteria listed should provide a basis for establishing guidelines to aid those responsible for planning future solid-waste sites in the county and should be useful in other areas of Florida that have similar hydrogeologic conditions. Illustrations include Generalized sections showing geology; Hydrologic map showing drainage, thickness of undifferentiated sand and clay, areas of artesian flow, areas of sinkholes, location of public water supplies, and location of sanitary landfill sites; Generalized soil permeability map; and Potentiometric surface and water table during wet period, November 7-9, 1967. (Woodard-USGS)
W71-07638

HYDROLOGIC SETTING OF DEER POINT LAKE NEAR PANAMA CITY, FLORIDA,
Geological Survey, Tallahassee, Fla.
G. H. Hughes.
Florida Bureau of Geology Map Series No 38, 1970. 1 Sheet, Text, 5 fig, 1 map, 2 tab, 11 ref.

Descriptors: *Hydrologic data, *Lakes, *Florida, Water quality, Inflow, Water levels, Rainfall, Air temperature, Water temperature, Water resources, Chemical analysis, Water utilization, Evaluation, Surface waters, Surface-groundwater relationships, Data collections, Water quality, Water supply.
Identifiers: *Deer Point Lake (Panama City, Fla), Hydrologic Atlas.

Deer Point Lake was formed in 1961 by construction of a low-head causeway dam across the northern part of North Bay at Deer Point about 8 miles north of Panama City, Fla. The lake provides an ample water supply for the continued economic growth of the Panama City area and adds to the recreational facilities available for tourists and residents of that area. During 1968 the total water withdrawn from Deer Point Lake for municipal and industrial use averaged about 40 mgd, or slightly less than 15% of the streamflow that entered th lake during the 1968 drought. Chemical analyses of water taken from the lake the day before the dam was closed showed that the concentrations of chloride averaged about 11,000 mg/liter. Because of mixing of the saline lake water with the large throughflow of fresh water, the average concentration of chloride was reduced to less than 400 mg/liter within 3 months after dam closure and to less than 40 mg/liter within a year. This one sheet atlas contains tables and illustrations of data concerning water quality, streamflow entering the lake, lake water levels, rainfall, air temperature, and water temperature. (Woodard-USGS)
W71-07639

HYDROLOGIC STUDIES AND COMPUTATIONS (GIDROLOGICHESKIYE ISSLEDOVANIYA I RASCHETY),
For primary bibliographic entry see Field 02E.
W71-07647

USE OF THE 'PROMIN' COMPUTER FOR CALCULATING THE EFFECT OF A RIVER BASIN RESERVOIR ON MAXIMUM WATER DISCHARGES (RUSSIAN: OPYT PRIMENENIYA EVM 'PROMIN DLYA RASCHETA VLIYANIYA VODOKHRANILISHCHA V BASSEYNE REKI NA MAKSIMAL 'NYYE RASKHODY VODY),
For primary bibliographic entry see Field 02E.
W71-07648

CALCULATIONS OF HIGH WATER DISCHARGES ON THE 'PROMIN' COMPUTER (RASCHETY RASHHODOV POLOVOD'YA NA EVM 'PROMIN'),
For primary bibliographic entry see Field 02E.
W71-07649

TYPICAL CHARTS OF UNIT INFLOW OF HIGH WATERS FROM LOWLAND RIVERS OF SOUTHWESTERN EUROPEAN USSR (KHARAKTERNYYE GRAFIKI ELEMENTARNOGO PRITOKA VYSOKIKH POLOVIDIY RAVNINNYKH REK YUGO-ZAPADA YEVROPEYSKOY TERRITORII SSSR),
For primary bibliographic entry see Field 02E.
W71-07650

08. ENGINEERING WORKS

8A. Structures

WATER WAVES GENERATED BY LANDSLIDES,
Asian Inst. of Tech., Bangkok (Thailand).
E. Noda.
Proceedings American Society of Civil Engineers, Journal of the Waterways Harbors and Coastal Engineering Division, Vol 96, No WW4, p 835-855, Nov 1970. 21 p, 12 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Waves (Water), *Landslides, Dam design, Reservoirs, Wave height, Coastal engineering, Earthquakes, Tsunamis, Bank stability, Two-dimensional, Analytical techniques, Solutions, Equations, Theory, *Wave generation, Comparative studies, Experimental data, Numerical analysis, Shores, Foreign research.
Identifiers: Empirical methods, Thailand.

The problem of water waves generated by landslides along coastlines or in enclosed bodies of water is of great practical interest to design engineers when geological factors predict the possibility of a landslide. Two distinct types of landslide are considered--vertical and horizontal. The vertical landslide is modeled by a 2-dimensional box falling vertically. The horizontal landslide is modeled by a 2-dimensional wall that moves into the fluid domain. Theoretical solutions are obtained, assuming that the geometric and dynamic parameters of the problem are known. Graphs are presented for motion with constant velocity. Results of experiments to verify the vertical landslide theory compare favorably in the region where linearized theory is valid. An approximate method is developed to find the amplitude of the largest wave in the nonlinear region by utilizing the solutions obtained from linear theory for vertical landslides. The approximate method is applied to the Lituya Bay, Alaska landslide of July 9, 1958, to estimate the largest wave. (USBR)
W71-07070

LOCK AND DAM NO. 13, ARKANSAS RIVER NAVIGATION PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and L. J. Shows.
Sponsored by US Army Engineer District, Little Rock. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-8, July 1970. 19 p, 6 tab, 25 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers, Dikes.
Identifiers: *Navigation dams, *Lock and Dam No 13 (Arkansas River Project), Arkansas River Navigation Project, Navigation conditions, Revetments.

Lock and Dam No. 13 is proposed for construction on the Arkansas River about 7 miles downstream of Van Buren, Ark. Model investigation was concerned with the study of navigation conditions in the approaches to the lock to determine the effects of the proposed regulating structures on channel development in the reaches upstream and downstream of the structure and with the development of measures required to overcome or minimize the effects of any adverse conditions. An undistorted, semifixed-bed, 1:120-scale model reproduced about 7.4 miles of the Arkansas River and additional bank area. The results of the investigation indicated the need for modifications in the regulating structures to improve navigation conditions through the reaches upstream and downstream of the lock. Conditions in the bend and in the crossing downstream can be improved by raising the elevation of the dikes and revetment farther downstream to head of crossing. Construction of a wing dike would reduce frequency of maintenance dredging. (Franco-WES)
W71-07171

CONSIDERED LAKE ERIE-LAKE ONTARIO WATERWAY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 06B.
W71-07172

LOCK AND DAM NO. 14, ARKANSAS RIVER NAVIGATION PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, and L. J. Shows.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-71-1, Feb 1971. 33 p, 6 tab, 5 photo, 31 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers.
Identifiers: *Navigation dams, *Lock and Dam No 14 (Arkansas River Project), *Arkansas River Navigation Project, *Navigation conditions.

Project will provide a navigable pool extending upstream about 20 miles to the Robert S. Kerr Dam. The investigation, concerned with the study of navigation conditions in the approaches to the lock with the proposed design and with the development of modifications required to produce adequate channel depths and to overcome or minimize the effects of any adverse navigation conditions, was

conducted on an undistorted, 1:120-scale, semifixed-bed model, reproducing about 3.4 miles of the Arkansas River and adjacent overbank area. Results indicate that: because of location of lock with respect to the bend upstream, navigation conditions for downbound tows approaching lock would tend to be difficult and hazardous; satisfactory navigation conditions can be developed by modification of existing structures and realignment of right bank upstream of the lock; because of the training structures required to develop adequate channel depths and currents satisfactory for navigation, velocities in reaches just upstream and downstream of dam will tend to be high during high flows; velocity of currents affecting navigation in lower approach can be reduced by excavation of channel downstream of the spillway; and shoaling in the lower lock approach will be a problem. (Franco-WES)
W71-07175

CALCASIEU SALTWATER BARRIER, PROTOTYPE SECTOR GATE TESTS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. F. Bastian.
Sponsored by US Army Engineer District, New Orleans. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-71-4, Feb 1971. 14 p, 1 tab, 10 pl.

Descriptors: *Barriers, *Prototype tests, *Gates, *Saline water intrusion.
Identifiers: *Calcasieu Saltwater Barrier, *Sector gates, Navigation structures.

Prototype tests were conducted on the sector gate at the Calcasieu Saltwater Barrier navigation structure in March 1970. The controlled variables were the rate of gate openings and the differential reverse head. Prototype tests showed that the hydrodynamic and friction forces were much greater than anticipated in the design. The prototype data agreed reasonably well with the model data of a similar gate. (Bastian-WES)
W71-07178

DEVELOPMENT OF NAVIGATION AT LOCK AND DAM NO. 17, ARKANSAS RIVER PROJECT; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
J. J. Franco, J. E. Glover, and B. K. Melton.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-12, Sept 1970. 21 p, 19 pl.

Descriptors: *Locks, *Hydraulic models, Dams, Navigable rivers, Gates.
Identifiers: *Navigation dams, *Lock and Dam No 17 (Arkansas River Project), *Arkansas River Navigation Project, Navigation conditions, Verdigris River, Tainter gates.

Lock and Dam No. 17 will comprise a nonnavigable gated dam with three 61-ft-wide by 27-ft-high tainter gates 9.8 miles above the confluence of the Arkansas and Verdigris Rivers, and a 110- by 600-ft lock located about 0.6 mile east in an excavated, slack-water navigation canal. Two 1:120-scale fixed-bed models, reproducing about 1.8 mi of upper and about 2.1 mi of lower reaches of the river channel and the slack-water navigation canal, were used to study navigation conditions at the upstream and downstream entrances to the navigation canal, and to determine flow conditions that could be expected near the entrances to the slack-water canal and through existing and proposed bridges and the modifications required to produce satisfactory navigation conditions through the reach. Results of the investigations are given. (Spivey-WES)
W71-07181

THE SOUTH LAKE TAHOE WATER RECLAMATION PROJECT,
Hill (Clair A.) and Associates, Redding, Calif.
For primary bibliographic entry see Field 05D.
W71-07193

ENGINEERING A HOLE IN THE GROUND.
Hawthorne, Inc., Houston, Tex.

Bulletin No S, EH-656, 756, 856, 956 and 1056, 1964. 24 p, 33 fig.

Descriptors: *Drilling, *Water wells, Drilling equipment, Drilling fluids, Wells, Pump, Mud, Gravels.
Identifiers: *Shot-hole drilling, Hole size, Bitsize, Annulus area, Up-hole velocity, Hole fluid requirements, Bit penetration vs. rotary speed, Jet drilling, Horsepower requirements, Drilling mud functions, Lost circulation, Gravel drilling, Crooked holes, Reaming stabilizer.

The characteristic problems related to drilling relatively small diameter holes are generally quite similar. The basic objective is fundamentally economic - to produce the maximum hole at minimum competitive cost for equipment and labor, and to provide a reasonable footage price to the customer and reasonable footage profit to the contractor. The booklet covers the general characteristics of shot hole drilling problems in some depth with abundant figures and sparse references. (Campbell-NWWA)
W71-07203

WELL AND WELL FIELDS IN TEXAS GULF COAST SEDIMENTS,
Guyton and Associates, Austin, Tex.
M. L. Klug, and W. F. Guyton.
Water Well Journal, Vol 14, No 1, p 14, p 27-30, Jan 1960.

Descriptors: *Water wells, *Well fields, Aquifer characteristics, Specific capacity, Observation wells, Drilling, Logging (Recording).
Identifiers: *Large capacity industrial wells, *Gulf coast, Pump tests, Well interference, Fresh water sands, Salt water sands.

Geologic and hydraulic characteristics of the aquifers in the vicinity where a groundwater supply is to be developed must be carefully evaluated to obtain the most economical and efficient wells and well field. Although this article deals primarily with wells in the Gulf Coast sediments, much of it is applicable to other parts of the United States. The Texas Gulf Coast sediments are comprised of alternating layers of sand and clay to a depth of several thousand feet. Thicknesses of individual layers range from a few feet to several hundred feet. In some areas there is considerable thickening and thinning of individual layers and many times a layer will pinch out completely in a short distance. Character and thickness of water-bearing sands vary both areally and with depth. The formations have a regional dip toward the coast. Dips may range from a few feet per mile in the outcrop areas to more than 100 feet per mile downdip. Local and sometimes widespread structures create variations from this regional pattern. The maximum depth at which fresh water occurs in the Gulf Coast sands varies from zero to more than 5,000 feet. In some areas brackish water may be encountered throughout all the sediments, while in other areas fresh water may be encountered in all sands to depths of more than 3,000 feet. In many places fresh water sands are encountered below sands which contain brackish water. Sands which contain fresh water in one area may contain brackish water only a short distance down-dip. (Campbell-NWWA)
W71-07204

WATER WELL CONSTRUCTION,
Louisiana House of Representatives, Baton Rouge.
W. P. Arceneaux.
Proceedings of the 26th Annual Short Course for Superintendents and Operators of Water, Sewerage, and Industrial Waste Disposal Systems, Div. Engineering Research Bull, No 75, p 28-33, 1964.

Descriptors: *Water wells, *Drilling, Screens, Equipment, Corrosion, Casing.
Identifiers: *Test hole, Screen slection, Well gravel treatment, Naturally developed wells, Water well maintenance.

Written in laymen's terms, this report summarizes the more important aspects of water well construction. Test holes are recommended for complete aquifer evaluations before construction of a permanent well. Formation characteristics and water chemistry can be established in advance to assure proper well design. Screen selection can be made more appropriately. The report considers the value of gravel treatment, pump selection and well maintenance with the well owner in mind. (Campbell-NWWA)
W71-07206

JOHNSON SCREENS.
Universal Oil Products, St. Paul, Minn. Johnson Div.

Catalog 169. St. Paul, Minnesota, UOP Johnson, 1969. 35 p.

Descriptors: *Well screens, *Equipment, *Water wells, Well points, Groundwater, Wells, Dewatering, Drilling fluid, Mud.
Identifiers: Self-jetting well points, Intake screens, Slot openings, Gravel pack wells, Formation analysis, Grain-size classification, Filter elements, Underdrains, Well screen installation, Gravel packing techniques, Water well development, Mechanical surging, Surging with air, High-velocity jetting, Water well cleaning chemicals.

This catalog briefly summarizes the use of screens for water well installations. A well screen is one of the most important parts of a water well because it serves as the water intake portion of the well. The well screen must allow sand free water to flow into the well in ample quantity and with minimum loss of head to supply the pump at full capacity. The screen affects the following factors: (1) capacity, (2) drawdown and pumping lift, (3) production of sand-free water and (4) maintenance cost and life of well. The catalog also discusses well screen accessories and application engineering approaches. (Campbell-NWWA)
W71-07207

HYDRAULICS OF RIVER CHANNEL CLOSURE,
Moskovskii Energeticheskii Institut (USSR).
S. V. Izbash, and Kh Yu. Khaldre.
Trans of Gidravlika Perekrytiya Rusel Rek, 1959. Hartford Connecticut, Daniel Davey and Company, Inc, 1970. 174 p, 45 ref.

Descriptors: *Civil engineering, *Hydraulic engineering, *Hydraulic structures, *Hydraulic-fill dams, *Dam design, *Dam construction, Channel morphology, Streamflow, Hydroelectric plants, Methodology, Mathematical studies, Equations, Flow rates, Velocity, Stress, Construction materials.
Identifiers: *USSR, *Channel closure hydraulics.

The hydraulics of channel closure are discussed in a textbook for civil engineers; the discussion includes laboratory and field study data. Practical and economic aspects of the experience of channel closure gained by Russian engineers on hydropower projects in the Soviet Union are made available to English speaking people. The main topics of discussion include: (1) Basic principles; (2) hydrologic analysis of channel contraction; (3) hydraulic resistance of material tipped into streams; (4) general characteristics of the different methods of river channel closure; (5) interaction of water flow and rockfill; (6) turbulent seepage

through fill material; (7) some features of fabricated-unit fills; and (8) worked examples of calculations relating to river closure. (Woodard-USGS)
W71-07335

SYMPHYSIOLOGICAL LINKS IN THE ECOSYSTEM OF MARINE OVERGROWTHS (Russian: Simfiziologicheskiye svyazi v oligomikstnom biotsenoze morskogo obrastaniya),
Akademiya Nauk SSSR, Moscow. Institut Okeanologii.
Ye. P. Turpayeva.
Akademiya Nauk SSSR Doklady, Vol 189, No 2, p 415-417, 1969. 3 p, 1 fig, 9 ref.

Descriptors: *Marine animals, *Industrial plants, *Ecosystems, Crustaceans, Crabs, Mollusks, Speciation, Biomass, Aquatic animals, Trophic level.
Identifiers: *Azov Sea, Polyps.

Hydraulic structures of the Zhdanov Metallurgical Plant on the Azov Sea have been fouled by an assemblage of marine life. In 1968 the biocenosis consisted of 4 species--the polyp Perigonimus megas Kinne, the crustacean Balanus improvisus Darwin, the crab Rhithropanopeus harrisii Goul, and the mollusk Tenellia adspersa (Nordman). Of the four, the polyp was predominant and had the largest number of links with the other three, creating for them a habitat. The direct and indirect links (including trophic) in the biocenosis are schematically shown. The degree to which these links influenced the number of populations of interacting species varied as a function of the season, hydrologic and biologic conditions and age of the populations. (Josefson-USGS)
W71-07336

PYROLYSIS GAS CHROMATOGRAPHIC DETERMINATION OF ARYLSULFONIC ACIDS AND SALTS,
Massachusetts Univ., Amherst.
Sidney Siggia, and Lee R. Whitlock.
Analytical Chemistry, Vol 42, No 14, p 1719-1724, Dec 1970. 3 fig, 5 tab.

Descriptors: *Gas chromatography, *Water analysis, *Sulfonates, Salts, Analytical techniques.
Identifiers: *Sulfonic acids, Chemical interferences.

The quantitative determination of arylsulfonic acids and their salts is described using pyrolysis gas chromatography to measure either sulfur dioxide or the parent hydrocarbon. Sulfur dioxide is recovered quantitatively; the parent hydrocarbon is recovered at the 50 percent level or less. A linear response for both is obtained for a range of sample weights from 0.2 to 1000 mg. Because of the sensitivity of gas chromatography, it is useful for direct analysis of aqueous solutions down to the parts-per-million concentration of sulfonate. The presence of sodium sulfonate does not interfere. By making sample solutions basic, the interference from sulfuric acid in sulfur dioxide measurement is eliminated. Addition of carbohydrozide to the pyrolysis sample will significantly increase hydrocarbon recovery; for example, the recovery of benzene from benzenesulfonic acid is increased to 98 percent. Best results were obtained when the hydrozide was used alone without added diluent. (Mortland-Battelle)
W71-07401

DETERMINING SEEPAGE CHARACTERISTICS OF MILL-TAILINGS DAM BY THE FINITE-ELEMENT METHOD,
Bureau of Mines, Washington, D.C.
For primary bibliographic entry see Field 08B.
W71-07455

THE SAN FERNANDO, CALIFORNIA, EARTHQUAKE OF FEBRUARY 9, 1971.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07659

DAMAGE TO CONSTRUCTED WORKS, ASSOCIATED WITH SOIL MOVEMENTS AND FOUNDATION FAILURES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 08D.
W71-07662

DAMAGE TO WATER SUPPLY SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 08D.
W71-07663

DRILLER'S HANDBOOK NO. 1,
Petroleum Publishing Co., Tulsa, Okla.
J. O. Scott, and E. McGhee.
Oil and Gas Journal Technical Manual Reprint, Fifth Printing, 1964. 81 p.

Descriptors: *Drilling, *Drilling equipment, Oil industry, Oil wells, Rotary drilling, Casings, Pumps.
Identifiers: *Drilling line, *Drill string, *Mud pump, Drill collars, Tool joints, Drill pipe, Pump sizes, Pump maintenance, Pump operation, Pump installation.

Of interest to the novice experienced driller and drilling engineer, this handbook covers (1) design, handling and maintenance of drilling line, (2) design, handling, and maintenance of drill pipe, drill collars and tool joints, (3) installation, operation and maintenance of mud pumps, and (4) problems of high-pressure drilling. Written entirely in driller's language, the handbook is very useful for solving practical problems on the job with large oil rigs or smaller mineral-water well rigs. (Campbell-NWWA)
W71-07683

DRILLER'S HANDBOOK NO. 2,
Petroleum Publishing Co., Tulsa, Okla.
E. McGhee, P. L. Moore, G. R. Gray, J. W. Speer, and B. Q. Green.
Oil and Gas Journal Technical Manual Reprint, Fourth Printing, 1964. 70 p.

Descriptors: *Drilling, *Drilling equipment, Oil industry, Oil wells, Rotary drilling, Drilling fluids, Casings, Pumps.
Identifiers: Draw works, Compounding transmission, Chains, Drum brakes, Auxiliary brakes, Clutches, V-Belts, Drilling rate factors, Hydrostatic pressure, Bit weight, Rotary speed, Drilling-fluid properties, Hydraulic horsepower, Lost circulation materials, Economics of drilling, Contract bidding.

Of interest to the novice and experienced driller and the drilling engineer, Handbook No. 2 serves as an excellent companion to Handbook No. 1 and covers (1) the draw works and compounding transmission, (2) five factors that affect drilling rate, (3) chemical in drilling mud, (4) how to get the most hole for your money and (5) which lost-circulation materials to use and how to use them. There are three major steps which assure profit in contract drilling (1) intelligent bidding (2) drilling efficiency and (3) keeping costs low. Bidding and making hole depend on the geographical area, but keeping costs down carry through in every area. It starts with getting the proper equipment, continues and ends with maintaining that equipment properly. Written entirely in driller's language, the handbook is very useful for understanding the operation of many kinds of drilling equipment and for understanding the factors involved in more efficient drilling. The handbook is applicable to oil, water and mineral drilling operations. (Campbell-NWWA)
W71-07684

8B. Hydraulics

GATED SPILLWAY FOR RAYSTOWN RESERVOIR, JUNIATA RIVER, PENNSYLVANIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt, and T. E. Murphy.
Sponsored by US Army Engineer District, Baltimore. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-15, Dec 1970. 9 p, 1 tab, 4 photo.

Descriptors: *Spillways, *Spillway gates, *Hydraulic models, Open channel flow.
Identifiers: *Raystown Reservoir, Juniata River, Flip buckets.

Model investigation of the two-bay spillway for Raystown Dam was concerned with flow conditions in the spillway approach, over the weir, and in the chute; performance of the flip bucket at the lower end of the chute; and the adequacy of riprap on the left bank across the Juniata River from the spillway discharge channel. Of primary concern were severe surges at the spillway gates that had been observed in models of other projects where operating conditions were similar to those at Raystown spillway. Tests were conducted in a 1:60-scale model that reproduced 1000 ft of upstream approach channel, the entire spillway including weir, chute, and flip bucket, and about 1000 ft of the downstream channel. Surges at the spillway gates did not occur under any anticipated operating conditions. Except for a minor deficiency in the height of a portion of the chute walls, all elements of the structure performed essentially as planned by the designers. (Oswalt-WES)
W71-07168

SPILLWAY FOR OAKLEY DAM, SANGAMON, ILLINOIS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer.
Sponsored by US Army Engineer District, Chicago. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-13, Nov 1970. 10 p, 15 photo, 18 pl.

Descriptors: *Spillways, *Hydraulic models, *Stilling basins, Open channel flow, Riprap.
Identifiers: *Oakley Dam, Sangamon River.

Tests on spillway were conducted on a 1:60-scale model to determine flow conditions in approach and exit channels and the performance of various elements of the structure. Particular emphasis was placed on the selection of a stilling basin that would perform satisfactorily with a Froude number (3.0 plus or minus) of entering flow insufficient for ideal performance of a hydraulic-jump type basin. Approach flow conditions were generally satisfactory; no modifications to abutments were required. Tests also indicated that stone size selected for wave protection along the upstream embankment would be sufficiently large. The capacity of spillway was greater than computed; this is attributed to less than anticipated losses at the abutments and the absence of submergence effects of spillway flow. Basin selected for prototype construction was 70 ft shorter than the original design, utilized a 100-ft-long apron with 6-ft-high chute blocks, one row of 6-ft-high baffle piers, and 3.5-ft-high end sill. Observations also indicated that the roadway and bridge immediately downstream of the structure do not appear to be endangered at flows up to 25,000 cfs, nor do they impair stilling basin performance. Riprap protection is required on the embankments and in the exit below the structure. (Spivey-WES)
W71-07169

SPILLWAY FOR COPAN DAM, LITTLE CANEY RIVER, OKLAHOMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-9, July 1970. 13 p, 11 photo, 16 pl.

Descriptors: *Spillways, *Hydraulic models, *Stilling basins, Open channel flow.
Identifiers: *Copan Dam, Little Caney River.

Stilling basin for Copan Dam, which is expected to be subjected to unit discharges as large as 860 cfs, was studied on a 1:60-scale comprehensive model to confirm design and performance of proposed stilling basin and exit area. Flow conditions in approach area and over spillway were satisfactory. Original design stilling basin, which under design discharge conditions is subject to flow with a Froude number of 3, performed adequately. However, alternate designs were investigated and the model indicated that length of stilling basin could be reduced 20 ft without impairing hydraulic performance. Model tests were also conducted to investigate adequacy of proposed riprap for protection of exit area and feasibility of a retaining dike or levee which paralleled the center line of exit channel. Failure of both the exit channel protective stone and the levee occurred with design discharge conditions. However, the height of levee required to prevent overtopping and the magnitude and direction of currents along levee were determined in order that a stable levee could be provided, if desired. (Fletcher-WES)
W71-07170

SPILLWAY FOR KAW DAM, ARKANSAS RIVER, OKLAHOMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Sponsored by US Army Engineer District, Tulsa. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-14, Dec 1970. 15 p, 11 photo, 25 pl.

Descriptors: *Spillways, *Hydraulic models, Open channel flow, Stilling basin.
Identifiers: *Kaw Dam, Arkansas River.

Spillway for Kaw Dam, which is expected to be subjected to discharges as large as 616,200 cfs, was studied on a 1:100-scale comprehensive model to determine flow conditions in the approach and exit channels and the performance of various elements of the structure. Modifications to left abutment were recommended to provide a more economical design without inducing excessive turbulence, surging, and/or drawdown in gate bays adjacent to left abutment. Capacity of spillway as determined with the model was slightly less than computed. Modification of left abutment did not alter the capacity. Tests indicated that original design stilling basin performed satisfactorily. Tests also indicated that use of a dike to prevent return flow from the large expanse left of the exit channel and stilling basin would permit reducing height and length of the left training wall and prevent excessive scour along left portion of exit channel. The designs of the right stilling basin training wall and the right tailrace training wall also were developed with the model. (Fletcher-WES)
W71-07176

SALAMONIE DAM FLIP BUCKET PROTOTYPE TESTS, SALAMONIE RIVER, INDIANA,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. F. Bastian.
Sponsored by US Army Engineer District, Louisville. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Miscellaneous Paper H-71-1, Jan 1971. 7 p, 5 pl.

Descriptors: *Prototype tests, *Jets, *Energy dissipation, Open channel flow.
Identifiers: *Flip buckets, *Salamonie Dam.

Prototype tests were conducted at Salamonie Dam in December 1969 to measure the jet throw distance from the flip bucket for three different discharges and the velocity distribution 1 ft upstream from the ramp crest for these same discharges. The actual throw distances agree reasonably well with computed design values. (Bastian-WES)
W71-07177

SPILLWAY AND OUTLET WORKS, TOCKS ISLAND DAM, DELAWARE RIVER, PENNSYLVANIA, NEW JERSEY, AND NEW YORK; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
E. S. Melsheimer.
Sponsored by US Army Engineer District, Philadelphia. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-10, July 1970. 15 p, 27 photo, 25 pl.

Descriptors: *Spillways, *Outlet works, *Delaware River, *Hydraulic models, Open channel flow, *Surges, Stilling basins.
Identifiers: *Tocks Island Dam, *Spillway chute.

The spillway for Tocks Island Dam was studied on a 1:60-scale comprehensive model and a 1:64-scale spillway model to determine flow conditions in the approach and exit channels and the performance of various elements of the structure. Modifications to both abutments were required to correct unequal distribution of flow that caused considerable turbulence and drawdown in the spillway bays adjacent to the abutments. Expected capacity of spillway was not adversely affected by the turbulence at the abutments. The surging phenomenon observed in gate bays at the larger gate openings was eliminated by maintaining a minimum bay width not less than 1.2 times the controlled head on the spillway, or about 53.5 ft in the six-bay spillway. The original spillway chute was modified to achieve reduction in cost without sacrificing hydraulic performance. To provide acceptable basin action the original basin had to be lowered 10 ft in elevation. Recommended stilling basin utilized a 204-ft-long apron at el 271.5 surmounted by two rows of 12-ft-high baffle piers and an 8.5-ft-high end sill. Riprap protection is required along the downstream toe of right embankment. (Melsheimer-WES)
W71-07179

DESIGN FOR FLOOD CONTROL AND WAVE PROTECTION, CHAGRIN RIVER, EASTLAKE, OHIO; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. E. Chatham, Jr.
Sponsored by US Army Engineer District, Buffalo. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-11, Sept 1970. 18 p, 11 tab, 33 photo, 26 pl.

Descriptors: *Flood control, *Waves (Water), *Hydraulic models, Breakwaters, Lake Erie, *Shore protection.
Identifiers: *Chagrin River, *Eastlake (Ohio).

A 1:75-scale model of the lower 2000 ft of the Chagrin River and sufficient offshore area in Lake Erie to permit generation of the required test waves was used to investigate the arrangement and design of certain proposed improvements with respect to wave action and flood control. Proposed improvement plans consisted of (1) arrowhead breakwaters in Lake Erie at the mouth of the river, aggregating about 2360 ft in length; (2) realignment and enlargement of the river channel from Lake Erie through the city of Eastlake, with levees where required to supplement channel enlargement; (3) a spur channel and an access channel for navigation; (4) recreational facilities at the river mouth; and (5) the addition of beach fill and protective groins along the shoreline east of the east breakwater. A 60-ft-long wave machine and electrical wave-height measuring and recording apparatus were utilized in model operation. Conclusions from test results are given. (Chatham-WES)
W71-07180

SPILLWAY FOR ALUM CREEK DAM, ALUM CREEK, OHIO; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. A. Pickering.
Sponsored by US Army Engineer District, Huntington. US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report H-70-4, Apr 1970. 11 p, 3 photo, 13 pl.

Descriptors: *Spillways, *Hydraulic models, Open channel flow, Stilling basins, Gates, Discharge coefficients.
Identifiers: *Alum Creek Dam, Tainter gates.

Tests were conducted on a 1:60-scale model of the Alum Creek Dam spillway to determine flow conditions in the spillway approach channel, discharge characteristics of the spillway, stilling basin performance, and flow conditions in the outlet channel. The spillway consisted of an ogee crest with three 34-ft-wide by 25-ft-high tainter gates, a spillway chute, and a hydraulic-jump type stilling basin. Flow conditions in the cured approach channel to the spillway were satisfactory for the expected discharges. The discharge capacity of the original design was slightly greater than expected. Discharge coefficients and pier and abutment contraction coefficients were determined from model data. The original design stilling basin did not perform satisfactorily. However, a satisfactory and more economical design was developed. Velocities of flow were measured in critical areas of the approach and outlet channels for use in design of riprap protection. (Pickering-WES)
W71-07182

A STUDY OF STORM-WATER INLET CAPACITIES,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
William A. Wintz, and Yung H. Kuo.
Available from the National Technical Information Service as PB-196 129, $3.00 in paper copy, $0.95 in microfiche. Louisiana Department of Highways, 1970. 96 p, 61 fig, 19 tab, 7 ref. DOT BPR 4663-042.

Descriptors: *Intakes, *Drainage systems, *Drainage engineering, *Surface runoff, *Hydraulic models, *Road design, Model studies, Hydraulics, Hydraulic similitude, Hydraulic engineering, Drains, Highways, Runoff, Storm runoff, Louisiana.
Identifiers: *Storm water inlets, *Highway drainage, Inlet capacities.

Graphs and equations are presented for use by engineers in computing the capacities of four standard types of storm water inlets used by the Louisiana Department of Highways. Full-size model studies were made of the hydraulic characteristics of these inlets at Louisiana State University. The model, representing one lane of a highway with curb and inlet, was 12 feet wide and 72 feet long. It was completely adjustable to permit varying the longitudinal and cross slopes, for changing inlets and curbs, and for supplying either one-way or two-way flow. The water flow was controlled to produce uniform and steady flow conditions over a surface having a roughness coefficient (Manning's 'n') of 0.01, approximating that of a concrete roadway. Experiments were conducted to determine the ratio of the total flow intercepted by each of the four standard inlets when used under different conditions simulating actual field installations. Two different curb types were used -- a roll-over curb and a barrier curb. The inlets were combination types consisting of a surface grate and a curb open-

ing. Two graphs were developed for each set of variable parameters. By entering the graphs with assumed values of flow and cross-slope, the ratio of intercepted flow to total flow and the linear spread of water over the road width can be predicted. Recommendations are made on curb selection, cross slope, and inlet types. Empirical flow formulas are also presented. (Poertner)
W71-07199

SOME PRELIMINARY OBSERVATIONS ON TRANSITION IN A PIPE,
Technion-Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
I. Wygnanski.
Partially supported by Boeing Scientific Research Labs. Available from the National Technical Information Service as N71-10473, $3.00 in paper copy, $0.95 in microfiche. Technion-Israel Institute of Technology, Department of Aeronautical Engineering TAE Report 108, Apr 1970. 36 p, 18 fig, 10 ref.

Descriptors: *Turbulent flow, *Transition flow, *Pipe flow, Critical flow, Froude number, Turbulence, Closed conduit flow, Velocity, Reynolds number.

Conventional and conditionally sampled hot-wire measurements were taken in a pipe at Reynolds numbers corresponding to the onset of turbulence. The laminar velocity profile is distorted in an axisymmetric fashion with increasing Re. At Re over 4000 the increase of Re has no significant effect on the shape of the laminar velocity profile even when turbulent slugs appear. Some gross characteristics of turbulent slugs were examined; a typical slug is symmetrical provided that it originates in the pipe and it is not triggered by an obstacle at the inlet. Average measurements of turbulence within the slug show that a turbulent slug behaves in much the same way as the fully developed turbulent pipe flow. (Knapp-USGS)
W71-07242

HYDRAULICS OF RIVER CHANNEL CLOSURE,
Moskovskii Energeticheskii Institut (USSR).
For primary bibliographic entry see Field 08A.
W71-07335

FLUX DEVELOPMENT REGION IN SUBMERGED JETS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
W. Hall C. Maxwell.
Journal of the Engineering Mechanics Division, Proceedings of American Society of Civil Engineers, Vol 96, No EM6, Proc Paper 7756, p 1061-1079, Dec 1970. 9 fig, 2 tab, 16 ref.

Descriptors: *Temperature, *Tracers, *Turbulence, *Flow, Mass, Heat.
Identifiers: *Submerged jets, *Flux distribution, Momentum.

Solutions are obtained for flux distribution close to submerged turbulent jet outlets. All solutions use tabulated probability functions or exponential functions. A comparison is made with momentum flux data for axisymmetric jets and a plane-symmetric jet in a coplanar flow, and agreement is shown to be good. A generalized Reichardt hypothesis is employed to obtain Gaussian distributions for the flux of mass, heat and momentum and permits superposition of elementary solutions. The analysis is presented for plane and axisymmetric flows. An adjustment to the origin of the data matches axial flux data with the mathematical model and defines a spreading coefficient, leading to a complete definition of the flux distribution. The solutions are in the form of a distorted chisquare distribution, and two distorted normal distributions. A simple solution beyond the potential core uses the axial distribution of flux to obtain the radial distribution directly. The analysis shows promise of providing straightforward solutions for free turbulent flows involving complex boundary conditions. (Upadhyaya-Vanderbilt)
W71-07436

DETERMINING SEEPAGE CHARACTERISTICS OF MILL-TAILINGS DAM BY THE FINITE-ELEMENT METHOD,
Bureau of Mines, Washington, D.C.
Charles Daniel Kealy, and Richard A. Busch.
Available from the National Technical Information Service as PB-197 027, $3.00 in paper copy, $0.95 in microfiche. Report of Investigations RI-7477, Jan 1970. 113 p, 34 fig, 2 tab, 52 ref.
Identifiers: *Seepage, Mathematical models, *Water pollution, Control, *Tailings, Earth dams, Computer programs, Embankments, Stress, Two dimensional flow, Soil mechanics, Finite element analysis, *Mill tailings disposal.

Finite-element, mathematical models that solve LaPlace's and Richard's equations numerically were used to locate the phreatic surface within tailings pond embankments and to define the subsurface flow of water from the pond. Both must be known to design structurally and environmentally safe tailings dams. The permeability distribution within and beneath the embankment, the fluid potential values upgradient and downgradient from the embankment, and the geometry and elevation of an approximately impermeable layer at some depth beneath the embankment were used as computer inputs in analyzing over a dozen finite-element models of tailings dams varying structurally from simple to complex. Results predicted with the finite-element model were confirmed with measurements in a laboratory model of a tailings pond and in the field. Of particular importance to the design of safe slopes, all data indicated that the phreatic surface within a tailings dam is concave upward, a configuration opposite that in most earth dams. The close correlation between predicted and experimental values confirmed the practicability of using the finite-element technique to design safe tailings dams.
W71-07455

EFFECT OF RAIN COLLECTING BASINS ON THE YEARLY INFLUX OF POLLUTANTS INTO A SEWER MAIN: FUNDAMENTALS OF DIMENSIONING COLLECTING BASINS,
For primary bibliographic entry see Field 05G.
W71-07527

STORM WATER/SEWAGE CONTROL,
For primary bibliographic entry see Field 05D.
W71-07528

FINE-MESH MECHANICAL SCREEN CONCENTRATES PEAK WASTE LOADS.
For primary bibliographic entry see Field 05D.
W71-07534

BED LOAD TRANSPORTATION IN ALLUVIAL CHANNELS,
Uttar Pradesh Irrigation Research Inst., Roorkee (India).
For primary bibliographic entry see Field 02J.
W71-07613

EFFECTS OF MECHANICAL CLEANING OPERATIONS ON FLOW IN LARGE CONDUITS,
Metropolitan Water District of Southern California, Los Angeles. Hydraulic Design Section.
George F. Horowitz, and Nelson N. Lee.
ASCE Proceedings, Journal of the Hydraulic Division, Vol 97, No HY 5, Paper 8110, p 677-689, May 1971. 13 p, 10 fig, 1 tab, 2 ref.

Descriptors: *Cleaning, *Open channel flow, *Canals, *Roughness (Hydraulic), *Water conveyance, California, Conduits, Closed conduit flow, Flumes, Irrigation canals.
Identifiers: *Canal cleaning, *Conduit cleaning.

By following a systematic cleaning and maintenance program in recent years, the Colorado River Aqueduct has been kept in condition to deliver substantially greater flows of water to the coastal plain of Southern California than it was originally designed to carry. The condition of the conduit surfaces is briefly described, as well as the annual cleaning operations designed to remove flow-impeding aquatic deposits from the walls of the conveyance system. An analysis of the variations in Manning's roughness coefficient n is presented for various components of the system. A comparison of such n values before and after mechanical cleaning of the aqueduct is given in summary form. (Knapp-USGS)
W71-07615

8C. Hydraulic Machinery

FLOW INVESTIGATION IN A FRANCIS TURBINE,
Institute of Turbomachinery, Graz (Austria).
H. Fachbach.
Paper 70-WA/FE-16, Transactions American Society of Mechanical Engineering Series D -- Journal of Basic Engineering, 1970. 9 p, 16 fig, 9 ref.

Descriptors: Hydraulic machinery, *Francis turbines, Turbine parts, Turbine runners, Turbine efficiency, Turbine blades, *Experimental data, Theoretical analysis, Fluid flow, Instrumentation, Boundary layer, Coriolis force, Circulation, Velocity, Losses, Impellers, *Turbines, Specific speed, Foreign research, Hydraulic design, *Hydraulic turbines.
Identifiers: Austria, Mechanical models, Analytical method.

Development of hydraulic machines during the past decades was characterized by empiric methods leading to high efficiencies but contributing little to knowledge of the flow field in the machinery. For computation and design, 1- or 2-dimensional methods combined with experimental results were often used. Recently, 3-dimensional analytical methods developed in the fields of compressors or gas turbines were used in designing hydraulic parts and computing flow data. All methods of analysis are based on assumptions; the usefulness to be tested by experimental investigations. Results of theoretical and experimental investigations of the flow in a Francis water turbine are presented. The flow visualization with the aid of rotating 5-borehole probes provides the relative velocities, the pressure and energy distribution, the slip factor, the boundary layers, and the secondary flow. Theoretical and experimental results are compared, and the usefulness of assumptions based upon computations is discussed. (USBR)
W71-07067

ON THE INFLUENCE OF WATER TURBINE CHARACTERISTIC ON STABILITY AND RESPONSE,
English Electric Co, Ltd., Netherton (England).
E. Goldwag.
Paper 70-WA/FE-15, Transactions American Society of Mechanical Engineers, Series D--Journal of Basic Engineering, 1970. 13 p, 15 fig, 14 ref.

Descriptors: Hydraulic machinery, *Hydraulic turbines, *Stability, Characteristics, *Machine design, Hydraulic engineering, Velocity, Head (Fluid mechanics), Accuracy, Fluid flow, Foreign research, High head, Low head, Mathematical analysis, Performance, Torque.
Identifiers: *Response time, Great Britain.

Given a real turbine characteristic, equations giving discharge and torque can be derived in terms of certain characteristic slopes, speed changes, and pressure deviations. For reaction turbines, the flow through the machines is speed-dependent and the effect of this phenomenon on the pressure dependence of flow is significant. Conventional representation of the pressure dependence of torque is cor-

rect only in the case of one particular type of turbine. A formula allowing establishment of the correct relationship for any characteristic is given. Nonlinearities of the quantity-gate and torque-gate relationships are examined, and the concept of the effective gate is introduced to improve accuracy of any predictions. Modified relationships are used in establishing the bounds of the region in which stable operation of a unit can be achieved, depending on the slope of the appropriate unit quantity-unit speed curve. Governor parameters leading to critical damping are a function of this characteristic slope. Neglecting the speed dependence of the turbine discharge can result in significant errors, especially when dealing with low head and high head machines. (USBR)
W71-07068

HYSTERESIS CHARACTERISTICS OF FRANCIS PUMP-TURBINES WHEN OPERATED AS TURBINE,
Hatachi Ltd., (Japan)
M. Yamabe.
Paper 70-FE-D, Transactions American Society of Mechanical Engineers, Series D -- Journal of Basic Engineering, 1970. 5 p, 8 fig, 1 tab, 2 ref.

Descriptors: *Francis turbines, *Pump turbines, *Hysteresis, Design, *Characteristics, Experimental data, Pumped storage, Specific speed, Turbine parts, Foreign research, Turbine runners, Guide vanes, Fluid flow, Cavitation, Hydraulic machinery, Turbine efficiency, Torque, Prototypes, Model studies, *Hydraulic turbines, Pumps.
Identifiers: Japan, Mechanical models.

Pump turbines for pumped storage projects have a broad range of operating head when compared with turbines for conventional generating plants. Proper adjustment must be given to guide vane and runner vane openings to maintain a good operating condition at all times. Accordingly, when a Francis pump turbine of fixed-vane type is used on pumped storage projects, a poor flow condition is unavoidable under certain condition of operation. Results obtained through experiments on models to determine the phenomena of the hysteresis characteristics of Francis pump turbines generated when operated as a turbine are described. The condition for generating the phenomena is regulated by the cavitation factor and guide vane openings and is affected by the specific speed of a pump turbine. Some additional characteristics of the flow state within a runner are discussed. (USBR)
W71-07069

NEW CONCEPTS IN ROTARY DRILLING BITS,
Smith Tool Co., Houston, Tex.
L. L. Garner.
Paper, Spring Meeting, Pacific Coast District, Division of Production, American Petroleum Institute, May 13-15, 1969, Los Angeles, California. Drilling-DCW, Nov 1969. 6 p.

Descriptors: *Drilling, *Oil industry, *Drilling equipment, Rotary drilling.
Identifiers: *Drill bits, Sealed bearing bits, Carbide bits, Bottom hole jet bits, Mud motor bits.

When drilling specific rock types, the basic design concept principles of 3-cone rotary drill bits in recent years has remained relatively constant with no significant changes. New applications, developments and improvements utilizing the same design principles are changing some of the oil concepts, creating many new and interesting trends. These new design areas, including applications, developments and improvements did not in all cases necessarily improve due to bit development. For example, most design developments improved in steps. Sometimes the breakthrough or advance was due to other related support equipment such as drill pipe, new mud pumps, circulation material etc. There are drilling tools which in the past have seen limited use due to the fact the right idea or application took time in developing. Replacement of roller bearings with friction bearings in rotary rock bits has seen limited success until recently, due to improved seals. Tungsten carbide bits in the past have been used, generally to drill only hard formations. Design changes following the same general concept of milled tooth designs are now using tungsten carbide bits to drill even softer rock. Bottom hole jets will be utilized more, as recent tests indicate their usefulness in conjunction with downhole mud motors. Mud motor bits or rotary bits, modified in recent years to resist the skidding and abrasion wear created when used with high speed down hole motors, are being improved and will be more widely used. (Campbell-NWWA)
W71-07205

8D. Soil Mechanics

A REVIEW OF APPLICATIONS OF THE FINITE ELEMENT METHOD OF ANALYSIS TO PROBLEMS IN SOIL AND ROCK MECHANICS,
Corps of Engineers, Vicksburg, Mass.; and Texas Univ., Austin.
N. Radhakrishnan, and L. C. Reese.
Soils and Foundation, Vol 10, No 3, p 95-112, Sept 1970. 18 p, 85 ref, append.

Descriptors: *Finite element method, *Soil mechanics, *Rock mechanics, Bearing capacity, Culverts, Embankments, Piles (Foundations), Analytical techniques, Seepage, Slope stability, Soil dynamics, Displacements, Soil engineering, *Reviews, *Bibliographies, Computer applications, Stress, Earth pressure, Settlement (Structural), Deformation, Numerical analysis.
Identifiers: Soil modulus.

The finite element method of analysis has been applied to a wide variety of problems in soil and rock mechanics. Developments and applications of the method to problems in slope stability, embankments, culverts, pavements, bearing capacity, piles, soil dynamics, seepage, and rock mechanics are reviewed. The finite element method is essentially a systematic numerical procedure for solving boundary values and some initial problems in continuum mechanics. High-speed digital computers have accelerated the development and use of this technique in several fields of civil engineering. Advantages of the finite element method compared to other numerical approaches are numerous. The method can handle: complicated, realistic geometries; layered isotropic or anisotropic materials with linear, nonlinear, or viscous properties; mixed boundary conditions; and constructional sequences in earth building operations. These features are particularly useful for solving problems in soil and rock mechanics. Good comparisons between results of the finite element solution and field and laboratory observations are reported. (USBR)
W71-07073

THE SAN FERNANDO, CALIFORNIA, EARTHQUAKE OF FEBRUARY 9, 1971.
Geological Survey, Washington, D.C.

For sale by Superintendent of Documents, US Government Printing Office, Washington, DC, 20402, Price $2.25. Joint publication of US Geological Survey and National Oceanic and Atmospheric Administration: Geological Survey Professional Paper 733, 1971. 254 p.

Descriptors: *Earthquakes, *California, Reviews, Surveys, Earthquake engineering, Faults (Geology), Seismic studies, Disasters, Landslides, Land subsidence, Movement, Reservoirs, Reservoir design, Dam failure.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971).

The violent tremors that shook the San Fernando area of California on the morning of February 9, 1971, are a reminder that earthquakes are a natural and permanent part of the environment in sizeable areas of the United States. Had the Lower Van Norman Lake Dam, which was close to collapse when the earthquake ended, actually failed, the San Fernando earthquake might have become infamous as the deadliest in United States history. The ground accelerations produced by this moderate magnitude (6.6) earthquake were the highest ever recorded, that is, in the 0.5- to 0.75-g range with several high-frequency peaks to 1 g. This report is a preliminary evaluation of data gathered by many groups of investigators during the first 3 weeks after the earthquake. A list of cooperating organizations is given. (See also W71-07660 thru W71-07663) (Knapp-USGS)
W71-07659

LANDSLIDING IN THE VICINITY OF THE VAN NORMAN LAKES,
Geological Survey, Washington, D.C.
T. L. Youd.
In: The San Fernando, California, Earthquake of February 9, 1971, Geological Survey Professional Paper 733, p 105-109, 1971. 5 p, 3 fig, 3 ref.

Descriptors: *Landslides, *Earthquakes, *California, *Hydrogeology, *Pore pressure, Soil mechanics, Groundwater, Soil strength, Faults (Geology), Disasters, Land subsidence, Dam failure, Movement, Reservoirs.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971), *Van Norman Lakes (Calif).

In the Van Norman Lakes area of Los Angeles, California, the 1971 earthquake triggered a large number of landslides, some of them down very gentle slopes. The Van Norman Lakes lie in a valley eroded in north-dipping strata of the Saugus and Modelo Formations. The lakes are impounded at their south ends by dams constructed across this valley. Because of the reservoirs and a confined aquifer in the Little Tujunga syncline, the water table in the general area is at a relatively high level and intersects the surface at several locations. The most reasonable explanation for slippage on slopes of such low gradient is that the underlying soils were partially or completely liquefied during the earthquake. The many sand boils observed on or near the slide are evidence that this occurred. It is probable that movements on many, if not all, of the slides in the alluvium surrounding the Van Norman Lakes were directly attributable to increased pore water pressures generated by the earthquake. (See also W71-07659) (Knapp-USGS)
W71-07660

WATER RESOURCES ASPECTS,
Geological Survey, Washington, D.C.
A. O. Waananen, and W. R. Moyle, Jr.
In: The San Fernando, California, Earthquake of February 9, 1971, Geological Survey Professional Paper 733, p 119-125, 1971. 7 p, 3 fig, 2 tab, 2 ref.

Descriptors: *Landslides, *Earthquakes, *California, *Hydrogeology, *Pore pressure, Soil mechanics, Groundwater, Soil strength, Faults (Geology), Disasters, Land subsidence, Dam failure, Movement, Rservoirs.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971), *Van Norman Lakes (Calif).

Damage to hydraulic structures constituted the major impact on water resources of the San Fernando earthquake of February 9, 1971. The effects on the water resources of the region included noticeable fluctuations in the stages of streams and reservoirs and water levels in wells, the roiling of water in water-supply systems, short-term changes in groundwater levels. The major damage was caused by the principal M6.6 shock that occurred at 0601 hours February 9. The Van Norman Lakes, a series of reservoirs at the head of the San Fernando Valley, suffered severe damage. The earthfill dams on both the Upper and the Lower Van Norman Lake were severely damaged by the earthquake. The dam at the upper lake moved about 2 m downstream and the crest slumped substantially. The dam on Lower Van Norman Lake, initially completed in 1918, was fractured, the crest

slumped, and a large part of the upstream concrete facing of the dam slid into the reservoir. Fortunately, the dam was not breached. (See also W71-07659) (Knapp-USGS)
W71-07661

DAMAGE TO CONSTRUCTED WORKS, ASSOCIATED WITH SOIL MOVEMENTS AND FOUNDATION FAILURES,
Geological Survey, Washington, D.C.
T. L. Youd, and H. W. Olsen.
In: The San Fernando, California, Earthquake of Feb 9, 1971, Geological Survey Professional Paper 733, p 126-132, 1971. 7 p, 8 fig.

Descriptors: *Earthquakes, *California, *Reviews, Surveys, Earthquake engineering, Faults (Geology), Seismic studies, Disasters, Landslides, Land subsidence, Movement, Reservoirs, Reservoir design, Dam failure.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971).

This report describes earthquake damage to dams and canals, transportation routes, utilities, and buildings in the northern San Fernando Valley that was caused by, or associated with, various types of soil movements and foundation failures. Because our reconnaissance was relatively brief and limited in scope, the information presented is a preliminary and partial account of these types of damage. The February 9 earthquake severely damaged the Upper and Lower Van Norman Dams. The latter appeared to have been on the brink of failure, which would have created catastrophic inundation of the heavily populated area below. Eighty thousand people were forced to abandon their homes for 4 days while the water level in the reservoir was lowered to a level which would preclude flooding in case of further damage to the dam during strong after-shocks. In the vicinity of the Van Norman Lakes, sections of several canals were badly damaged and rendered unusable until major repairs could be made. Several flood-control dikes also suffered slumping, but because they were not impounding water at the time of the shock, their failure presented no immediate hazard. The principal damage to the Lower Van Norman Dam was a massive upstream slope failure which dislodged a major segment of the earthfill embankment and deposited it on the reservoir floor. (See also W71-07659) (Knapp-USGS)
W71-07662

DAMAGE TO WATER SUPPLY SYSTEMS,
California Univ., Los Angeles.
C. Martin Duke.
In: The San Fernando, California, Earthquake of Feb 9, 1971, Geological Survey Professional Paper 733, p 225-240, 1971. 16 p, 12 fig, 1 tab.

Descriptors: *Earthquakes, *California, *Reviews, *Surveys, Earthquake engineering, Faults (Geology), Seismic studies, Disasters, Landslides, Land subsidence, Movement, Reservoirs, Reservoir design, Dam failure.
Identifiers: *San Fernando (Calif), *San Fernando Earthquake (1971).

The California earthquake of February 9, 1971, did extensive damage to water-supply systems and their components. Most of this damage occurred in and around the most heavily shaken area, which included Sylmar, San Fernando, the Van Norman Reservoirs, and the Jensen Filtration Plant. Types of damage ranged from major dam failures to breakage of house connections for water and sewage, and included trunkline breaks, aqueduct and tunnel damage, and structural failures in a major filtration plant. Strong-motion accelerographs and seismoscopes functioned at several dams. (See also W71-07659) (Knapp-USGS)
W71-07663

8E. Rock Mechanics and Geology

A NEW METHOD FOR THE DETERMINATION OF DEFORMABILITY IN ROCK MASSES,
Laboratorio Nacional de Engenharia Civil, Lisbon (Portugal).
M. Rocha, and J. N. da Silva.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 2, No 21, Belgrade, Yugoslavia, Sept 1970. 15 p, 26 fig, 3 tab, 8 ref.

Descriptors: Rocks, *Deformation, Deformation modulus, Measurement, Field tests, Equipment, *Rock mechanics, *Rock properties, *Flat jack method.
Identifiers: Dilatometers.

A new method for determining deformability in rock masses is presented to show how large undisturbed volumes can be tested quickly and economically. The method essentially consists of applying pressures using thin flat jacks in slots cut with a diamond disk at the surface of the rock mass. The authors describe the machines developed, indicate the procedure for calculating the modulus of deformability of the rock mass from the openings measured in the slots, discuss the problem of the characterization of deformability in rock masses by resorting to correlations between results of the new method and results of dilatometer tests, and present instances of application of the new method. (USBR)
W71-07065

A REVIEW OF APPLICATIONS OF THE FINITE ELEMENT METHOD OF ANALYSIS TO PROBLEMS IN SOIL AND ROCK MECHANICS,
Corps of Engineers, Vicksburg, Mass.; and Texas Univ., Austin.
For primary bibliographic entry see Field 08D.
W71-07073

STUDIES OF PROPERTIES AND CONDITIONS OF ROCK MASSIFS BY SEISMIC ACOUSTICS METHODS,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Meloratsii, Moscow (USSR).
A. G. Sykoshin.
Proceedings 2nd Congress International Society of Rick Mechanics, Theme 1, No 14, Belgrade, Yugoslavia, Sept 1970. 7 p, 4 fig, 8 ref.

Descriptors: Rocks, *Fissures, *Joints (Geology), Site selection, Test procedures, *Seismic investigations, Anisotropy, *Rock mechanics, *Rock properties, *Seismic tests, Heterogeneity, Deformation, Ultrasonics, *Rock tests, Ultrasonic tests.
Identifiers: *Acoustic method.

The report deals with the procedures used and results obtained after the application of seismic-acoustic methods to study jointing, anisotropy, and heterogeneity of rock masses, as well as the influence of these factors on deformation properties of rocks. A special feature of the procedure is the application on a large scale of the multifrequency modifications of seismic acoustics (seismic, acoustic, and ultrasound methods). The studies determine: (1) the qualitative properties of jointing (volume of joints, prevailing directions of joint systems, and properties of joint filling); (2) the grade, character, and nature of anisotropy; and (3) the heterogeneity and dimensions of the heterogeneity elements (blocks). (USBR)
W71-07074

DETERMINATION OF ELASTIC PROPERTIES OF ROCKS USING VARIOUS ON-SITE AND LABORATORY METHODS,
Dames and Moore, Seattle, Wash.
M. Bukovansky.
Proceedings 2nd Congress International Society of Rock Mechanics, Theme 2, No 9, Belgrade, Yugoslavia, Sept 1970. 4 p, 1 tab, 8 ref.

Descriptors: Rocks, Elasticity (Mechanical), Field tests, Loading tests, Laboratory tests, Boreholes, Sandstone, Schist, Modulus of elasticity, Dolomite, *Rock properties, *Rock mechanics, *Plate load tests, Flat jack method.
Identifiers: Plate bearing tests, Czechoslovakia, Dilatometers, Radial jacking tests, Bedding.

Elastic properties of the rock mass comprise important input data for all engineering analyses; numerous laboratory and on-site methods have been developed for determining the elastic properties. A research program was conducted for high-pressure water tunnels on various sites in Czechoslovakia. Several static methods have been used for elastic properties determination, such as laboratory tests, borehole dilatometer tests, plate-load tests, flatjack tests, and radial jacking tests. Three different rock types have been tested: thick-bedded sandstones, highly fractured dolomites, and jointed crystalline schists. The plateload test is one of the simplest and most reliable methods for modulus estimation. Only when wide-spaced jointing or bedding occurs do radial jacking tests or calculation of the rock mass modulus using, separately, rock substance and joint properties, provide reliable data. (USBR)
W71-07076

8F. Concrete

PRECAST, REINFORCED CONCRETE MEMBERS IN THE CONSTRUCTION OF WATER SUPPLY AND SEWERAGE SYSTEMS,
For primary bibliographic entry see Field 05G.
W71-07537

8G. Materials

CAN POLYMERS HELP YOUR COLLECTION SYSTEMS,
For primary bibliographic entry see Field 05D.
W71-07529

STRETCHING OF VISCOELASTIC LIQUIDS,
Delaware Univ., Newark.
M. M. Denn, and G. Marrucci.
American Institute of Chemical Engineers Journal, Vol 17, No 1, p 101-103, Jan 1971. 3 p, 3 fig, 11 ref. OWRR Project A-009-DEL (1).

Descriptors: *Viscous flow, *Liquids, *Viscosity, *Shear, *Viscometers, Tensile stress, Analytical techniques, Heat transfer, Velocity, Time, Tensile strength.
Identifiers: *Viscoelastic liquids, Liquid stretch rate.

Analyses of stretching of a viscoelastic liquid have been interpreted as showing that there is a maximum stretch rate to which the material can be subjected, and several physical phenomena have been explained on this basis. This report shows theoretically and experimentally that the concept of a limiting stretch rate does not have general validity. (Woodard-USGS)
W71-07598

8H. Rapid Excavation

PERFORMANCE OF TUNNEL BORING MACHINES,
Southern California Metropolitan Water District, Los Angeles.
R. J. Proctor.
Engineering Geology Bull AEG, Vol 6, No 2, p 105-117, Fall 1969. 13 p, 9 fig, 1 tab, 39 ref.

Descriptors: *Tunneling, *Tunneling machines, Tunnel construction, *Rapid excavation, Earth

handling equipment, Rock excavation, Rocks, Diversion tunnels, Earth movements, Hardness, Compressive strength, Mining, Geology, Faults (Geology), Performance, Statistics, *Boring machines, Construction equipment, Bibliographies.
Identifiers: Greenside-McAlpine Tunneling Machine, Oso Tunnel, Colo.

Technological advances in tunnel boring machines are being made so rapidly that many present limitations soon will be overcome. Some information on the current performance of these machines and on tunneling events is desirable. More than 100 mole tunnels have been excavated in the world, the first being in Massachusetts in 1856. Some problems with moles, unconfined compressive strength related to moles, and specific references are discussed. Statistics cited are: (1) the largest mole cut a 36-ft 8-in.-dia tunnel for the Mangla Dam Diversion Tunnels system in West Pakistan; (2) the heaviest mole - 500 tons, excavated part of the Paris Subway; (3) the fastest mole excavation - cut 419 ft/day in the Oso Tunnel, Colorado; and (4) the hardest rock excavated by mole - 57,000 psi granite in Austria, 51,000 psi quartzite in Idaho, and rhyodacite in Nevada with a Mohs' hardness slightly greater than 7. (USBR)
W71-07066

IMMERSED TUNNEL CONSTRUCTION,
H. C. Wentink.
In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 42 p.

Descriptors: *Tunneling, *Construction, *Underground structures.
Identifiers: *Immersed tunnels, Technological improvement, Questionnaire.

The document is concerned with tunnels composed of elements constructed in a dry-dock or on a slipway and subsequently transported to the construction site, where they are sunk, placed on a foundation, and connected together under water. The questionnaire dealing with immersed tunnels brought in replies from twelve countries, many of which were based only on a theoretical knowledge of the subject or on experience with tunnels of very small cross-section.
W71-07507

HARD ROCK TUNNELING,
T. E. Howard.
In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 74 p.

Descriptors: *Tunneling, *Construction, *Underground structures, Drilling.
Identifiers: *Hard rock tunneling, Technological improvement, Questionnaire.

The report is intended to facilitate the orderly development of tunneling technology by focusing attention on the inadequacies of rock tunneling and the improvements that are needed. The data presented were derived from the results of a comprehensive questionnaire that was completed by individuals and organizations in 17 countries.
W71-07508

BOSTON STILL FACES A POLLUTION CONTROL PROBLEM: DEEP TUNNEL PLAN PROPOSED AS SOLUTION,
Joseph Cazzaza.
Water Wastes Eng, Vol 7, No 9, p 44-47, Sep 1970.

Descriptors: *Water pollution control, *Pollution abatement, Sewers, Sewerage, Treatment facilities, Massachusetts.
Identifiers: *Deep tunnel plan, *Boston (Mass).

In this article the related development of combined sewerage systems in the Boston metropolitan area is traced and some of the major attempts to abate pollution in the harbor and its estuaries are discussed. Presently, the sewage from the area south of the old Boston Main Drainage District is treated at the Nut Island plant, while most of the sewage from the remaining Metropolitan Sewerage District is treated at the Deer Island plant. The two plants provide primary treatment and chlorination for all dry-weather flows from the metropolitan area, yet they cannot handle the enormous quantities of mixed flows during storm conditions. A description of the deep tunnel plan, with an estimated construction cost of $430 million, is included.
W71-07509

RESEARCH AND DEVELOPMENT RELATED TO TUNNELING.
Organization for Economic Co-Operation and Development, Paris (France).

In: Advisory Conference on Tunneling of the Organization for Economic Co-Operation and Development, Aug 1970. 108 p.

Descriptors: *Tunneling, *Research and development, Construction, Underground structures.
Identifiers: Questionnaire.

The document is concerned with the status of applied research and development relating to tunneling technology. Applied research and development means theoretical and experimental studies of new design methods and construction techniques, including studies of the properties, character and behavior of tunnel structures, and of the ground mass in which they are constructed.
W71-07510

CUSTOM DESIGNED SHIELD LEAVES NO SPACE BEHIND AS IT SETS TUNNEL RINGS.

Construct Methods Equip, Vol 52, No 8, p 64-67, 70, 72, Aug 1970.

Descriptors: *Drilling, *Tunnel construction, *Tunneling machines, Tunnel design.
Identifiers: *Tunneling shield, *Mexico.

A tunneling shield used to drive a 30-ft diameter bore at shallow depths in soft, unstable ground, was designed to progress through drive cycles without leaving an annular space behind the shield after the shove had been made. The tunnel was driven up a constant incline having profile variations of from 0.8 to 7% at depths ranging from 52 1/2 feet to 16 feet below street level. Guidance made use of a laser and target system; excavation was performed by a dozen miners working from the shield's six breasting tables with pneumatic spades and rock breakers. A description of the tunneling cycle is given.
W71-07511

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES CENTER: ANNUAL REPORT, 1 JULY 1968 - 30 JUNE 1969,
California Univ., Los Angeles. Water Resources Center.
Arthur F. Pillsbury.
California Water Resources Center, Report No 17, (1970). 143 p. OWRR Project A-999-CAL (4).

Descriptors: *Projects, *Research and development, Hydrologic cycle, Precipitation, Evaporation, Transpiration, Groundwater, Soil water, Soil-water-plant relationships, Chemical precipitation, Water yield improvement, Water conservation, Water management (Applied), Watershed protect. and flood prev. Act, Pollutant identification, Water pollution sources, Water pollution effects, Waste treatment, Ultimate disposal, Water treatment, Water quality control, Planning, Evaluation, Cost allocation, Cost sharing, Pricing, Repayment contracts, Water demand, Water law, Engineering, Design, Financing.

This 1968-69 annual report reviews the research and related activities of the University of California Water Resources Center. Water cycle studies include general precipitation, evaporation and transpiration, groundwater, water in soils, water and plants, and chemical processes. Water supply augmentation and conservation includes water yield improvements, and conservation in agriculture. Water quality management and control studies include groundwater management and watershed protection. Water quality managment and protection includes identification of factors effecting degradation, sources and fate of degradation, effects of degradation, waste treatment processes, ultimate disposal of wastes, water treatment, and water quality control. Water resources planning includes techniques of planning, evaluation process, cost allocation, cost sharing, pricing/repayment, water demand, and water law and institutions. Engineering works include design. Each project is listed and briefly summarized, with data on investigators, funding and publications (including theses). (Popkin-Arizona)
W71-07153

THE UNIVERSITY'S ROLE IN NATIONAL WATER POLICY.
For primary bibliographic entry see Field 06B.
W71-07183

ANNUAL REPORT 1969-70.
Hawaii Univ., Honolulu. Water Resources Research Center.

Water Resource Research Center, University of Hawaii, Honolulu, Hawaii, 1971. 60 p. OWRR Project A-999-HI (5).

Descriptors: Hawaii, Domestic wastes, Storm runoff, Groundwater movement, Desalinization, Artificial recharge, Remote sensing, Evapotranspiration, Institutions, Hydrogeology, Bibliography, Hydrologic data, Seawater.
Identifiers: *Stormwater, *Water tracing, Water dating, Taiwan groundwater.

Annual progress report on the research program of the University of Hawaii Water Resources Research Center: all work reported except one relates to Hawaii water resources and includes pollution characteristics of domestic waste water effluents and stormwater, identification of the pollution effects of sugarcane irrigation return water, pilot desalting of brackish groundwater for domestic use, evaluation of artificial recharge practices in Hawaii, remote sensing of groundwater with electromagnetic radiation and mural induction methods, water tracing and dating with tritium and radiocarbon, tidal effects on groundwater levels, water budget of sprinkler irrigated sugarcane, Hawaii water resources institutions, updating Hawaiian hydrogeology documents, annotated bibliography on Hawaii water resources, the design of hydrologic data network, thermal properties of sea water, and geological confirmation of certain groundwater table configurations on the island of Hawaii. The non-Hawaiian project is Taiwan groundwater supply. (Lau-Hawaii)
W71-07682

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES CENTER: ANNUAL REPORT, 1 JULY 1968 - 30 JUNE 1969,
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 09A.
W71-07153

ANNUAL REPORT 1969-70.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 09A.
W71-07682

10. SCIENTIFIC AND TECHNICAL INFORMATION

GROUNDWATER POLLUTION FROM SANITARY LANDFILLS AND REFUSE DUMP GROUNDS, A CRITICAL REVIEW,
Marquette Univ., Milwaukee, Wis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05E.
W71-07194

BIBLIOGRAPHY, SELECTED REGIONAL, STATE, AND OTHER GOVERNMENTAL AGENCY WATER RESOURCES PLANNING DOCUMENTS,
Connecticut Office of State Planning, Hartford. Dept. of Finance and Control.
For primary bibliographic entry see Field 06A.
W71-07200

A BIBLIOGRAPHY OF ARCTIC WATER RESOURCES,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 02C.
W71-07333

SELECTING REGIONAL INFORMATION FOR GOVERNMENT PLANNING AND DECISION-MAKING,
California Univ., Los Angeles.
For primary bibliographic entry see Field 06B.
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- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources management at the Center for Urban Studies of the University of Chicago.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Research Institute of Rutgers University.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the EPA-Water Quality Office, Soap and Detergent Association, and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC.

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Textile wastes pollution at the School of Textiles of North Carolina State University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Agricultural livestock wastes at the Department of Agricultural Engineering of Iowa State University.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Water Quality Office of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association Research Foundation.

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